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OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
Rm. EB-49, 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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77-0470. Ralph, W.; Mathre, S. (Plant Quarantine Div., Dep. Health, Canberra, A. C. T., Australia). **Comments on fungicide treatment of wheat seed (and reply).** *J. Environ. Qual.* 54): 491-492; 1976. (17 references)

Literature references are presented to refute the statement that fungicide treatment of wheat seed is unnecessary. This letter-to-the editor points out reports of increased yield and stand with the use of seed treatments, and questions the availability of information on pathogen levels and seed vigor for the average farmer. Disadvantages of nonmercury compounds are discussed, and it is concluded that problems with mercury fungicides have resulted from past improper use. In a reply the author of the original article states that no yield increase was observed following fungicide treatment of the seeds since growers usually plant seed at a higher rate than is needed, compensating for small losses due to seed decay or damping off. He also recommends the use of combination nonmercurial preparations to combat resistance.

77-0471. Scifres, C. J. (Dep. Range Sci., Texas A & M Univ., College Station, TX 77843). **Herbicide nomenclature and related terminology.** *J. Range Manage.* 29(2): 174; 1976.

The use of standardized herbicide nomenclature is becoming increasingly necessary because of the rising number of publications of the use of herbicides for range improvement. Mixing of trade names and common names in such publications is confusing and unacceptable. The common name, chemical name, and trade name are defined and illustrated for 15 herbicides currently used for range improvement or showing promise in research.

77-0472. Kotter, E. (Chem. Forsch. Inst. Wirtsch. Oesterreichs, Vienna, Austria). **Zusatz- und Fremdstoffe in Nahrungs- und Futtermitteln und ihre Problematik.** [**Additives and contaminants in food and feeds and the problems entailed thereby.**] *Mitt. Chem. Forsch. Inst. Wirtsch. Oesterr. Oesterr. Kunststoffinst.* 28(1): 1-6; 1974. (12 references) (German)

Intentional and unintentional food additives are discussed. Flavorings and preservatives are used extensively today. Vitamins and mineral supplements may be added to foods. Undesirable contaminants include hormones and antibiotics administered to animals prior to slaughter. Pesticide residues along with industrial contaminants are among the highly undesirable contaminants of food, but pesticides are indispensable at present. The development of juvenile hormones as a replacement for conventional insecticides is promising. Government agencies in many countries are attempting to control pesticide ingestion.

77-0473. Norman, C.; Hay, A. **Seveso: the problems deepen.** *Nature* 264(5584): 309-310; 1976.

Results of previously undisclosed experiments by the U.S. Air Force and findings from an arena accidentally sprayed with dioxin-contaminated oil in 1970 have been used to draw conclusions regarding the dioxin contamination incident in Seveso. According to these results dioxin in the soil of the most heavily contaminated area can be expected to take as much as 14 years to break down to undetectable levels. There is unlikely to be much movement of dioxin in the soil and contamination will probably remain in the upper 12 inches, despite heavy rainfall. Wildlife mortality is anticipated. At the time of the Seveso explosion 150 women in the area were in the first trimester of pregnancy. Most requested therapeutic abortions, and 29 abortions have been performed. These fetuses are being examined, but results are not available yet. The rate of spontaneous abortions in the Seveso area is reported to have increased to twice the Italian national average since July. Miscarriages were also reported in Vietnam after the spraying of dioxin-contaminated 2,4,5-T.

77-0474. Preussmann, R. (Inst. Toxikol. Chemother., Dtsch. Krebsforschungszent., Heidelberg, Germany). **Chemical carcinogens in the human environment: Problems and quantitative aspects.** *Oncology* 33(2): 51-57; 1976. (28 references)

Reports on carcinogenesis by environmental chemicals are reviewed. Determining the carcinogenicity of chemicals entails a number of problems, and the experiments on which the banning of certain chemicals was based are open to question. Critical factors exist in the monitoring of environmental chemicals in relation to quantitating human exposure to these compounds. Although a threshold dose for carcinogenic substances cannot be positively identified, it is possible to establish a dose at which no tumors will be induced to a high degree of probability within a normal life span. However, the existence of syncarcinogenic and other enhancing and/or modifying effects makes it impossible to define "safe" levels of carcinogenic compounds, as human cancer is probably caused by a combination of factors. Chemicals for which carcinogenicity to man has been proven or strongly suspected include arsenic compounds. DDT is cited as an example of a compound for which carcinogenicity has been demonstrated in some animal species but not in others.

77-0475. Roland, P.; Lafontaine, A. (Inst. Hyg. Epidemiol., Brussels, Belgium). **Emploi des pesticides et protection sanitaire.** [**Pesticide use and health protection.**] *Parasitica* 31(1): 5-21; 1976. (French)

Pesticides primarily present a health hazard to three groups of people: workers employed in pesticide manufacture, storage, or application of the products; people who consume food contaminated with pesticide residues; and people subject to general ecological effects relating to dispersal of pesticides in the environment. A variety of measures may and should be taken to reduce these hazards. They require thorough assessment of the potential harmful effects of the products and the pos-

sibilities for eliminating them, including objective consideration of the necessity for use of each individual preparation.

77-0476. PANS (London W8 5SJ, England). **PANS pesticide index.** *PANS* 22(1): 149-195-313; 1976. (12 references)

The PANS pesticide index is intended as a quick reference tool, providing common names and chemical names for the trade-named pesticides produced by numerous European, American, Japanese, and other nationality manufacturers. Use classifications are also provided. Common names approved by the British Standards Institution or the International Standards Organization are employed, or if neither of these is available, names are supplied by the Japanese Ministry of Agriculture and Forestry, Weed Science Society of America, Entomological Society of America, or the Canadian Standards Association or USA Standards Institute. The index is available from PANS as a separate.

77-0477. Lipa, J. J. (Inst. Environ. Protect., Poznan, Poland). **Niechemiczne metody ochrony sadow przed chorobami i szkodnikami. [Nonchemical methods of protecting plants from diseases and pests.]** *Postep. Nauk Roln.* 23(2): 57-64; 1976. (17 references) (Polish)

Methods of plant protection from pests and diseases which avoid the use of pesticidal chemicals are reviewed. The simplest alternative control method in some respects is the use of mechanical and cultural processes to reduce infestation. Practically useful results have been achieved with predators and diseases in controlling agricultural pests, beginning with the use of *Bacillus thuringiensis*. Antibiotics and similar biological products have been used in controlling plant diseases, and practical methods for employing entomophagous nematodes are under development. Genetic manipulation, including the use of sterile males, has proven highly effective against some insect species. Finally pheromones are useful in combination with trapping and other pest elimination methods, though their high cost has meant that they were primarily used for experimental purposes in the past.

77-0478. Wells, J. M.; Revear, L. G. (U. S. Dep. Agric., Agric. Res. Serv., Southeastern Fruit and Tree Nut Research Station, Byron, GA 31008). **Hydrocooling peaches after waxing: effects on fungicide residues, decay development and moisture loss.** *HortScience* 11(2): 107-108; 1976. (7 references)

Weight loss and decay after harvest of peaches coated with a water-insoluble, nonemulsified blend of petrolatum, mineral oil, and paraffin containing 2500 ppm benomyl and 5000 ppm Botran (dichloran) were unaffected by hydrocooling. Peaches that were waxed and hydrocooled under experimental conditions had Botran residues averaging 2.8 ppm, significantly below the 4.2 ppm on peaches which were waxed without hydrocooling. Under commercial conditions Botran residues were 2.1 to 2.2 ppm, not significantly different from those on unhydrocooled peaches, 2.5 ppm. Therefore decay and weight loss of peaches is controllable by applying a nonemulsified wax that contains adequate fungicide prior to hydrocooling.

77-0479. Dikshit, A. K.; Agnihotri, N. P.; Dewan, R. S.; Saxena, H. P. (Indian Agric. Res. Inst., New Delhi, India, 110012). **Dissipation of aldicarb in soil and pea plant.** *Indian J. Agric. Sci.* 46(3): 117-119; 1976. (8 references)

Aldicarb 10% granules were applied in furrows at 1.5 kg/ha at the time of planting peas. Initial soil residues were 13.70 ppm; residues persisted 80 days. Dissipation was first-order; half-life was 17 days. Aldicarb leached beyond 15 cm deep on the 30th day, but residues quickly degraded. In peas the aldicarb residues persisted 110 days. It concentrated in buds and rapidly translocated to pods. Aldicarb degraded rapidly in pods; detectable residues were not found at harvest.

77-0480. Verma, S.; Lal, R. (Indian Agric. Res. Inst., New Delhi, India 100012). **Residues and residual toxicity of endosulfan on cauliflower.** *Indian J. Agric. Sci.* 46(3): 125-129; 1976. (9 references)

Residues from commercial-grade endosulfan on the leaves of 3-month-old cauliflower from 0.05% treatment at 1100 liters/ha, estimated by bioassay with *Drosophila melanogaster* as the test insect, were below the tolerance limit of 2 ppm in 7 days after the first spraying and in 8 days after the second, 20 days later. It was 10 days at 0.1% concentration for both sprayings. In 4 days residues were below the tolerance limit on curds for both concentrations. Both concentrations gave almost identical aphid control for 8 days. Consuming curds treated at these concentrations the same day, whether cooked or washed, was considered dangerous; using them would be safe after about 4 days, when residues would decrease below the tolerance limit, 2 ppm. Eight and 10 day waiting periods for 0.05 and 0.1% concentrations were considered necessary before consumption of leaves.

77-0481. Singh, B. D. N.; Saxena, A. P. (Chandra Shekhar Azad Univ. Agric. Technol., Kanpur 208 002, India). **Persistence of malathion residues on the foliage and ears of barley.** *Indian J. Agric. Sci.* 46(3): 148-151; 1976. (9 references)

Malathion residue persistence on ears and foliage of barley was studied by chemical assay. Malathion was sprayed on barley at 1000 liters/ha at 0.05%, 0.1%, and 0.15% concentrations. Residues dissipated to the tolerance limit for mammals, 8 ppm, within 2 days when sprayed at 0.05% concentration. At higher concentrations residues dissipated to the tolerance limit in 5 days. No residues remained after 10 days.

77-0482. Chaudry, M. M.; Nelson, A. I.; Perkins, E. G. (Univ. of Illinois, Dep. Food Sci., Urbana, IL 61801). **Distribution of aldrin and dieldrin in soybeans, oil, and by-products during processing.** *J. Am. Oil Chem. Soc.* 53(11): 695-697; 1976. (11 references)

Soybean samples from nontreated and aldrin-treated fields were analyzed for dieldrin and aldrin in oil. By simulating commercial processing on a semimicro level, oil and waste samples collected after refining, bleaching, and deodorization were also subjected to pesticide residue analysis. Generally, dieldrin levels in soybeans, or soybean fractions, had a clear positive relationship with the aldrin applications. Soybean cotyledons contained lesser amounts of aldrin than whole beans, hulls, and/or hypocotyles and fines. Deodorization of oil was most effective in the removal of pesticides, and deodorizer distillate had high concentrations of aldrin and dieldrin, although pesticide levels in the oil decreased somewhat after each processing step. Processed oil was free of aldrin and dieldrin residues up to instrumental detection limits.

77-0483. Hashemy-Tonkabony, S. E.; Soleimani-Amiri, M. J. (Tehran Univ., Dep. Food Hyg., Lab. Toxicol., P. O. Box 3262, Tehran, Iran). **Detection and determination of chlorinated pesticide residues in raw and various stages of processed vegetable oil.** *J. Am. Oil Chem. Soc.* 53(12): 752-753; 1976. (3 references)

One hundred ten samples of oil at various stages of processing, including raw, neutralized, hydrogenated, decolorized, deodorized, and shortenings were taken from seven operating oil processing factories in Iran and analyzed by gas chromatography to detect chlorinated pesticide residues. Results show DDT and its metabolites were present in raw and processed oil, along with lindane, dieldrin, and endrin; their relative loss is attributed to chemical and heat treatment.

77-0484. Holloman, M. E.; Hutto, F. Y.; Kennedy, M. V.; Swanson, C. R. (Mississippi State Univ., Dep. Biochem., Mississippi State, MS 39762). **Thermal degradation of selected chlorinated herbicides.** *J. Agric. Food Chem.* 24(6): 1194-1198; 1976. (21 references)

With a view toward the disposal of large quantities of waste pesticides by incineration, degradation temperatures of chloramben, linuron, and propanil were determined in open crucibles and sealed ampules. There was evidence that vaporization prior to degradation could occur in the open crucibles. Degradation temperatures determined in sealed ampules were 275°C for chloramben and linuron and 125°C for propanil. Gaseous products produced by incinerating the herbicides at 400°C were identified by mass spectrometry and gas chromatography. Gases identified included HCN, NO, CH_3NH_2, HCl, NO_2, CH_3Cl, C_2H_3Cl, and C_2H_5Cl. Products resulting from complete combustion were predicted by a series of chemical equilibrium composition calculations. The major products were CO_2, CO, N_2, NO, H_2O, HCl, and Cl_2. (Author abstract reprinted by permission of the American Chemical Society)

77-0485. Liang, T. T.; Lichtenstein, E. P. (Dep. Entomol, Univ. Wisconsin, Madison, WI **Effects of soils and leaf surfaces on the photodecomposition of [^{14}C]azinophosmethyl.** *J. Agric. Food Chem.* 25(6): 1205-1210; 1976. (15 references)

The effects of environmental conditions on the photodecomposition of [^{14}C]azinphosmethyl by light were investigated with glass surfaces (controls), three soil types, and surfaces of bean and corn leaves. The insecticide was not degraded in the dark. Exposure of [^{14}C]azinophosmethyl on glass, in soils, or on leaves to sunlight or ultraviolet (uv) light for 8 h resulted in the degradation of the insecticide and loss of radiocarbon, most on glass surfaces and least in soils. The amounts of noninsecticidal water-soluble photoproducts due to sunlight amounted to 18.6% of the applied radiocarbon on glass surfaces, 6.5% in a sandy soil, 4.3% in a loam soil, 2.5% in a muck soil, 3.5% on corn leaves, and 1.4% on bean leaves. With increasing soil moisture content increased degradation occurred with uv light, but not with sunlight. The amounts of unextractable, bound residues produced due to irradiation increased with soils of higher organic matter and with increasing moisture contents. With sunlight, *N*-methylbenzazimide was producd only on corn leaves, while *N*-methylbenzazimide sulfide (or disulfide), benzazimide, and the oxygen analogue of azinphosmethyl were produced on both corn and bean leaves, but primarily on bean leaves. The insecticide was least susceptible to photodecomposition when used as a granular formulation. (Author abstract reprinted by permission of the American Chemical Society)

77-0486. Isensee, A. R.; Holden, E. R.; Woolson, E. A.; Jones, G. E. (U. S. Dep. Agric., Agric. Res. Serv., Pesticide Degradation Lab., Beltsville, MD 20705). **Soil persistence and aquatic bioaccumulation potential of hexachlorobenzene (HCB).** *J. Agric. Food Chem.* 24(6): 1210-1214; 1976. (11 references)

Soil was treated with 0.1 to 100 ppm of HCB and stored under aerobic (sterile and nonsterile) and anaerobic nonsterile conditions for 1 year in covered containers to retard HCB volatilization. No soil-incorporated HCB was lost at any treatment rate or under any storage condition. Five species of aquatic organisms were exposed to three water concentrations of HCB for 3 to 33 days in aquatic model ecosystems. Bioaccumulation potential among the organisms averaged 0.6 to 2.0 x 10^3 water content for algae (*Oedogonium cardiacum*), snails (*Helisoma* sp.), daphnids (*Daphnia magna*), and mosquito fish (*Gambusia affinis*), and 6 to 16 x 10^3 for catfish (*Ictalurus punctatus*). Further studies confirmed that catfish consistently accumulated more HCB than did the other four species. (Author abstract reprinted by permission of the American Chemical Society)

77-0487. Albach, R. F.; Lime, B. J. (U.S. Dep. Agric., Agric. Res. Serv., Southern Region, Subtropical Texas Area, Food Crops Utilization Res. Lab., Weslaco, TX 78596). **Pesticide residue reduction by the process of preparing whole orange puree.** *J. Agric. Food Chem.* 24(6): 1217-1220; 1976. (6 references)

Bearing Marrs orange trees [*Citrus sinensis* (L.) Osbeck] sprayed with a mixture of pesticides (azinphosmethyl, carbophenothion, ethion, parathion, malathion, dioxathion, dimethoate, dicofol, and chlorobenzilate) were harvested at 1, 7, and 21 days after application. Samples from each harvest were analyzed for pesticide residues: (1) unwashed; (2) after washing by a common processing plant method; and (3) after being processed into whole orange puree. Washing eliminated from 8 to 35% of the residue initially present on the unwashed fruit. The whole orange puree had a residue level 71 to 95% less than the unwashed fruit. Individual pesticide residues did not exceed the tolerances established by the Environmental Protection Agency (EPA), even on the unwashed fruit harvested 1 day after the spray application. Residues on fruit harvested 3 months after the last spray application in a normal pesticide program were no higher than 1.4% of the tolerance limit. It was concluded that residues in oranges received by processors would not exceed EPA tolerances for the pesticides tested, and also that pesticide residues in whole orange puree were substantially less than that of the unwashed fruit and well within the established tolerances for whole fruit. (Author abstract reprinted by permission of the American Chemical Society)

77-0488. Smith, G. N.; Fischer, F. S.; Axelson, R. J. (Ag-Organic Dept., Dow Chem. Co., Lake Jackson, TX 77566). **Volatilization and photodecomposition of plictran miticide.** *J. Agric. Food Chem.* 24(6): 1225-1229; 1976. (6 references)

Recently, a new organic tin product, Plictran miticide containing tricyclohexyltin hydroxide, has been developed for the control of mites in apples, pears, and citrus fruits. Photodecomposition and volatility studies were conducted with this miticide. The results indicate that tricyclohexyltin hydroxide rapidly undergoes photo-

decomposition, the main products being inorganic tin (80%) with traces of dicyclohexyltin oxide, cyclohexylstannic acid, and tricyclohexyltin hydroxide unchanged. The traces of tetracyclohexyltin which were present in the samples as an impurity were not affected by irradiation. The amount of tricyclohexyltin hydroxide depends on the length of exposure and the intensity of the sunlight. The longer the exposure and the more intense the light the more tricyclohexyltin hydroxide will be decomposed. Volatility studies indicate that tricyclohexyltin hydroxide is not volatile from the dry state, but that the compound can be lost from a moist surface by co-distillation. The rate at which the miticide will be lost depends on the temperature and quantity of water evaporated. The dicyclohexyltin oxide is volatile from the dry state and can co-distill with water. (Author abstract reprinted by permission of the American Chemical Society)

77-0489. Watters, F. L. (Agric. Canada, Res. Station, Winnipeg, Manitoba). **Persistence and uptake in wheat of malathion and bromophos applied on granary surfaces to control the red flour beetle.** *J. Econ. Entomol.* 69(3): 353-356; 1976. (6 references)

Malathion EC and bromophos WP were diluted with water and applied at 0.05 liter/m² to provide a deposit of one g/m² AI on concrete, metal, fir plywood, and maple hardwood floor surfaces in a farm granary. The rate of uptake of each insecticide in wheat, in contact with the treated hardwood floor, was determined by analysis of core samples. Insecticide persistence on treated surfaces was assessed by 24-h exposures of adults of *Tribolium castaneum* (Herbst) from 1-40 wk after treatment. Both insecticides provided 100% mortality on metal surfaces for 40 weeks. Malathion provided 100% mortality on fir plywood for 40 wk and on the maple hardwood floor for 4 weeks. Bromophos provided 100% mortality on fir plywood for 18 wk and on the maple hardwood floor and concrete for 4 weeks. Malathion showed no increased uptake in stored wheat after 4 wk but bromophos showed increased uptake from 0.28 ppm after 18 wk storage to 0.47 ppm after 40 weeks. The experiments indicated that malathion and bromophos need not be applied as frequently to granary surfaces of metal and wood as to those of concrete. (Author abstract by permission)

77-0490. Beall, M. L., Jr. (U.S Dept. Agric., Agric. Res. Serv., Agric. Environ. Qual. Inst., Beltsville, MD 20705). **Persistence of aerially applied hexachlorobenzene on grass and soil.** *J. Environ. Qual.* 5(4): 367-369; 1976. (11 references)

The persistence of aerially applied hexachlorobenzene (HCB, C_6Cl_6) (equivalent to 10 ppm in the top 5 cm of soil) in "simulated" pasture was followed for 19 months in the greenhouse. The hypothesis that burning off the grass canopy would decrease the persistence of HCB in soil was also tested. Gas-liquid chromatographic analysis revealed no degradation products of HCB in plant or soil samples and that burning off the grass had no significant effect on subsequent persistence of HCB in soil. On day 1 (20 hours after application) the top 2 cm of soil contained 5.60 ppm HCB. Concentrations (air-dry basis) found after 0.5, 1, 6.5, 12, and 19 months were 45.2%, 24.4%, 7.9%, 4.7%, and 3.4% of day 1, respectively. Concentration in the 2- to 4-cm layer averaged 0.11 ppm with no significant change over the 19 months. Day 1 grass samples contained 1,060 ppm HCB, but after 2 weeks only 15.6 ppm (1.5% of day 1) were found. Concentrations after 1, 6.5, 12, and 19 months were 0.66%, 0.06%, 0.01%, and < 0.01% of day 1, respectively. HCB appears to volatilize rapidly from plant and soil surfaces but could be persistent within the soil. (Author abstract by permission)

77-0491. O'Connor, G. A.; van Genuchten, M. T.; Wierenga, P. J. (New Mexico Agric. Exp. Stn., Las Cruces, NM 88003). **Predicting 2,4,5-T movement in soil columns.** *J. Environ. Qual.* 5(4): 375-378; 1976. (9 references)

A solute model developed by van Genuchten and Wierenga was used to calculate 2,4,5-T effluent data from soil columns. The model has been previously shown to adequately predict effluent curves. The present work shows that 2,4,5-T effluent curves may be adequately predicted without prior knowledge of the effluent curves for a particular soil column given: (i) model parameters derived from 2,4,5-T effluent curves for other soil columns, or (ii) model parameters obtained from tritium effluent curves for the same columns. The data suggest that once the physical model parameters have been characterized for a soil, reasonable predictions of 2,4,5-T (and perhaps other solutes) transport can be made given the adsorption coefficient for the solute. (Author abstract by permission)

77-0492. Guenzi, W. E.; Beard, W. E. (U.S. Dep. Agric., Agric. Res. Serv., Western Region, P. O. Box E, Ft. Collins, CO). **DDT degradation in flooded soil as related to temperature.** *J. Environ. Qual.* 5(4): 391-394; 1976. (17 references)

Raber silt loam was amended with ^{14}C-labeled DDT [1,1,1-trichloro- 2,2-bis(*p*-chlorophenyl) ethane] and incubated under anaerobic conditions (flooded) at several selected temperatures for 140 days. Soil samples were analyzed for DDT degradation products at intervals during the experiment. DDT degradation rates were temperature dependent, and after 7 days recovery were 80, 64, 44, 10, and 48% at 30, 40, 50, 60, and 70C, respectively. DDT was not degraded at 2C. The first identifiable intermediate product was DDD [1,1-dichloro-2,2-bis (*p*-chlorophenyl) ethane] followed by DDMU [1-chloro-2,2-bis (*p*-chlorophenyl) ethylene]. Under these reducing conditions, DDD was not degraded at 30C, but degraded at temperatures of 40C and higher. ^{14}C activity (applied as ^{14}C-DDT) remaining in the soil sample after solvent extraction, increased during degradation of the parent compound or of its degradation products. The maximum

amount of activity in the non-extractable fraction was found after 140 days in the 60C treatment, and represented 34% of the applied activity; whereas 49.6% of the activity was extractable, only 15.6% of this was identifiable. (Author abstract by permission)

77-0493. Paschal, D. C.; Neville, M. E. (Dep. Chem., Ill. State Univ., Normal, IL 61761). **Chemical and microbial degradation of malaoxon in an Illinois soil.** *J. Environ. Qual.* 5(4): 441-443; 1976. (11 references)

Chemical and microbial degradation of malaoxon was studied in an Illinois silty loam. This soil sample is typical of the glacial till soil used for agriculture in the Midwest. This sample had no history of pesticide application and demonstrates high microbial activity as evidenced by rapid degradation of malathion. To differentiate between microbial degradation and chemical decomposition, both heat-sterilized and nonsterile soil samples were prepared. Because pH has been shown to affect the rate of chemical hydrolysis, both heat-sterilized and nonsterile soil samples were prepared. Because pH has been shown to affect the rate of chemical hydrolysis, samples were adjusted to three different values of pH: 6.2, 7.2, and 8.3. Malaoxon (10 ppm) was added to both sterile and nonsterile samples, and chemical and microbial analyses were performed over a 5-day period. Chemical analyses were performed as hexane extractions followed by electron capture gas chromatography. Microbial numbers were estimated by conventional dilution and spread-plate techniques. Half-lives for malaoxon were determined for the samples. A pronounced effect was noted with pH; malaoxon has a half-life of approximately 3 days in the basic samples and a half-life of approximately 7 days in acidic samples. Only a minor effect on half-lives was noticed from microbial activity. This may be due in part to a demonstrated biocidal effect of malaoxon on soil microorganisms. The disappearance of malaoxon in soil was interpreted to be chemical hydrolysis. The persistence of malaoxon in acidic soils may be of significance in agricultural usage where acidic soil is desirable. (Author abstract by permission)

77-0494. Morrow, L. A.; McCarty, M. K. (Agric. Res. Serv., Mandan, ND, 58554). **Selectivity and soil persistence of certain herbicides used on perennial forage grasses.** *J. Environ. Qual.* (15 references)

Several herbicides were applied in the field to the cool-season grass smooth brome (*Bromus inermis* Leyss.) and to three warm-season grasses, sideoats grama [*Bouteloua curtipendula* (Michx.) Torr.], switchgrass (*Panicum virgatum* L.) and indiangrass [Sorghastrum nutans (L.) Nash] to evaluate herbicide persistence in soils supporting each of these perennial forage grasses. Herbicides were applied once and the soil was sampled to a depth of 91 cm, 4 and 16 months after application. Bioassays, with soybeans [*Glycine max* (L.) Merr.] as the test crop, were conducted in the greenhouse to determine the location of the herbicides in the soil profile. Most herbicide residues 4 or 16 months after application were located in the 0- to 8-cm soil depth. Only bromacil (5-bromo-3-*sec*-butyl-6- methyluracil), karbutilate [*tert*-butylcarbamic acid ester with 3-(*m*-hydroxyphenyl)- 1,1-dimethylurea] or terbacil (3-*tert*-butyl- 5-chloro-6- methyluracil) at high rates depressed soybean growth in soil from the 8- to 15-cm depth. Four months after herbicide application, a slight increase in soybean growth was evident in soil from the 15- to 30-cm depth where bromacil, karbutilate, or terbacil had been applied to bromegrass. Germination of seed harvested from each grass was not affected by herbicide treatments. (Author abstract by permission)

77-0495. White, A. W., Jr.; Asmussen, L. E.; Hauser, E. W.; Turnbull, J. W. (U. S. Dept. Agric., Agric. Res. Service, Byron, GA 31008). **Loss of 2,4-D in runoff from plots receiving simulated rainfall and from a small agricultural watershed.** *J. Environ. Qual.* 5(4): 487-490; 1976. (24 references)

Movement of 2,4-D [(2,4-dichlorophenoxy) acetic acid] was not significant in either surface or subsurface runoff from a small agricultural watershed on a sandy Coastal Plain soil. Surface runoff levels were highest for the first runoff event after herbicide application (0.56 kg/ha) each year, and initial concentrations were related to the time lapse between herbicide application and the date of the first runoff event. Maximum concentrations were 8.1, 6.2, and 2.5 μg/liter in 1970, 1971, and 1972, respectively. The corresponding time lapse for the same years was 20, 27, and 34 days. Persistence studies showed that the 2,4-D concentration in the surface 0.5 cm of soil decreased 95%, from 4.7 to 0.23 ppm in only 7 days, and after 34 days the soil concentration was only 0.01 ppm. Although subsurface flow was three times greater than surface runoff during the 3-year period, 2,4-D movement in subsurface water was negligible. Concentrations were usually zero or < 1 μg/liter. Soil sampled to a 90-cm depth showed no 2,4-D accumulation or buildup in the soil profile. Simulated rains (8.25 cm in 30 min) applied to subplots on the watershed showed that there is a potential for greater 2,4-D losses in surface runoff when it rains soon after herbicide application. When rains were applied 1, 8, and 35 days after herbicide application, the average 2,4-2,4-D concentrations in runoff were 25.2, 5.8, and 0.7 μg/liter, respectively. (Author abstract by permission)

77-0496. Grover, R.; Kerr, L. A.; Wallace, K.; Yoshida, K.; Maybank, J. (Agric. Canada, Res. Station, Regina, Saskatchewan S4P 3A2, Canada). **Residues of 2,4-D in air samples from Saskatchewan: 1966-1975.** *J. Environ. Sci. Health* B11(4):311-347; 1976. (15 references)

Residues of 2,4-dichlorophenoxyacetic acid (2,4-D) in samples of air from several sites in southern and central Saskatchewan during spraying seasons in 1966-1968 and 1970-1975 were determined by gas-liquid chromatography. Initially, individual 2,4-D esters were characterized by retention times and further confirmed by co-injection and dual column procedures. Since 1973 only

total 2,4-D acid levels were determined after esterification to the methyl ester and confirmed by gc/ms when possible. Up to 50% of the daily samples during any given year contained 2,4-D, with butyl esters being found most frequently. Daily mean atmospheric 2,4-D concentrations were between 0.01 and 1.22 $\mu g/m^3$, 0.01 and 13.50 $\mu g/m^3$, and 0.05 and 0.59 $\mu g/m^3$ for *iso*-propyl, mixed butyl, and *iso*-octyl esters, respectively. When the samples were analyzed for the total 2,4-D content, the maximum level of the total acid reached only 23.14 $\mu g/m^3$. In any given year and at any of the sampling sites, about 30% of the samples contained under 0.01 $\mu g/m^3$ of 2,4-D. In another 40% of the samples, 2,4-D levels ranged from 0.01 to 0.099 $\mu g/m^3$. Only about 30% of the samples contained 2,4-D concentrations over 0.1 $\mu g/m^3$, with only 10% or less exceeding 1 $\mu g/m^3$. No samples obtained with the high volume particulate sampler showed any detectable levels of 2,4-D, indicating little or no transport of 2,4-D adsorbed on dust particles or as crystals of amine salts.

77-0497. Hargrave, B. T.; Phillips, G. A. (Bedford Inst. Oceanogr., Dep. Environ., Fish. Mar. Serv., Mar. Ecol. Lab., Dartmouth, N. S. Canada B2Y 4A2). **DDT residues in benthic invertebrates and demersal fish in St. Margaret's Bay, Nova Scotia.** *J. Fish. Res. Bd. Can.* 33: 1692-1698; 1976. (21 references)

Organochlorine residues (*p,p'*-DDT and its metabolites) were measured in samples of benthic invertebrates and demersal fish taken from St. Margaret's Bay, Nova Scotia. No other organochlorine compounds were present in detectable amounts. ΣDDT levels in whole organisms, excluding lipid-rich tissues, grouped as benthic epifauna, infauna, and demersal fish were not significantly different and thus no accumulation occurs in this food chain. Atmospheric supply is probably the major source of low levels of contamination and a detritus-based food web may equalize residue concentration between various feeding types.

77-0498. Holmberg, D. J.; Lee, G. F. (George Clayton and Associates, Southfield, MI). **Effects and persistence of endothall in the aquatic environment.** *J. Water Pollut. Control Fed.* (17 references)

Endothall degradation was followed in a small pond in Wisconsin by a bioassay. The effects of herbicide on fish and plant life, water chemistry, and chlorophyll content were also determined. Results showed that after approximately 12 days of slow degradation, endothall broke down rapidly, reaching 0.1 mg/l, the limit of detection, in 18 days. Most of the weeds controlled by endothall dropped to the bottom of the pond within 7 days. Chara, unaffected by endothall treatment, infested the area. Endothall apparently did not cause any fish mortality. Although comparing treatment and control ponds was difficult, apparently endothall decreased chlorophilly content. The dissolved oxygen dropped and remained below the saturation level, but serious oxygen depletion was not observed. Oxygen was apparently supplied throughout the pond through mixing at all times. There did not appear to be any noticeable changes in the other water chemistry parameters that could be attributed to the herbicide.

77-0499. Cerutte, G.; Zapparigna, R.; Gerosa, S. (Ist. Ind. Agrar. Univ., Milan, Italy). **Residui di antiparassitari cloro fosfo-organici in latte e derivati.** [**Determination of residues of antiparasitic chlororganic and phosphoric compounds in milk and dairy products.**] *Latte* 161-165; 170-175; 1975. (12 references) (Italian)

Residues of the following compounds were determined in samples of cheese, milk, and other dairy products: α-BHC, β-BHC, lindane, heptachlor, aldrin, heptachlor epoxide, *p,p'*-DDE, dieldrin, *o,p'*-TDE, *p,p'*-TDE, *o,p'*-DDT, *p,p'*-DDT, DDVP (dichlorvos), ronnel, parathion, methyl parathion, and malathion. In some cases the pollution by these compounds was studied in the whole processing cycle from milk to cheese. The processing into cheese significantly reduced the residue concentrations. Lyophilization caused an important decrease in the level of pesticide contamination. In general, the dairy products analyzed showed a level of pesticide pollution below FAO-WHO standards.

77-0500. Leistra, M.; Smelt, J. H.; Lexmond, T. M. (Lab. Res. Insecticides, Marikeweg 22, Wageningen, The Netherlands). **Conversion and leaching of aldicarb in soil columns.** *Pestic. Sci.* 7(5): 471-482; 1976. (14 references)

Aldicarb was applied to soil columns in the laboratory which were leached by artificial rainfall. Concentrations of aldicarb, its sulfoxide and its sulfone in the effluent were measured by gas-liquid chromatography. The measured results were analyzed in some detail using a computation model. Aldicarb and its oxidation products were very mobile in soil, a fact which could be well described after introducing very low sorption coefficients in the computation model. Aldicarb itself was converted at a high rate following first order kinetics (half-life about 2 days). The best approximations obtained for the rate constant of sulfoxide conversion in two soils were about 0.03 and 0.06/day respectively (half-lives 23 and 12 days). Only a rather wide range of possible values could be obtained for the rate at which sulfone was decomposed. (Author abstract by permission)

77-0501. Hance, R. J. (Agric. Res. Council, Weed Res. Organization, Begbroke Hill, Yarnton, Oxford OX5 1PF, England). **Adsorption of glyphosate by soils.** *Pestic. Sci.* 7(4): 363-366; 1976. (11 references)

The adsorption of glyphosate in a slurry system by 9 soils was correlated with an arbitrary single point inorganic phosphate sorption index which gave a measure of unoccupied phosphate sorption capacity, but not with total phosphate sorption capacity at pH 2.6, the level of iron and aluminum soluble in Tamm's acid oxalate or with

clay content, organic matter content or pH. It is concluded that inorganic phosphate excludes glyphosate from sorption sites. The extent of adsorption was higher than, though of the same order as, that of diuron though the two are not related. From consideration of the results of previous experiments with plants grown in culture solution it is suggested that the low phytotoxicity of glyphosate applied to the soil is not due simply to high adsorption. Rather it is the result of a combination of moderate adsorption and the low intrinsic activity of this compound when made available to the root system. (Author abstract by permission)

77-0502. Takizawa, Y. (Sch. Publ. Health, Fac. Med., Akita Univ., Akita, Japan). [**Not yet regulated air pollutants: hydrogen cyanide.**] *Kankyo Hoken (Environ. Health Rep.)* 39(11): 1-5; 1976. (36 references) (Japanese)

The distribution of derivatives of hydrogen cyanide, the source of their occurrence, the route of human intake, the environmental concentration in the atmosphere and hydrosphere, and their effects on animals and humans were described. The derivatives cited herein are hydrogen cyanide itself, aliphatic nitriles such as acetonitrile, propionitrile, and acrylonitrile, and aromatic nitriles such as phthalodinitriles (*o*,-*m*- and *p*-isomers) and benzonitrile; especially cited are glycolonitrile and benzaldehyde cyanohydrin. In Japan, liquid hydrocyanic acid, materials which have absorbed hydrogen cyanide, and sodium cyanide are still registered as pesticides and are mainly used to control scale insects on fruit trees. Generally, the word "cyan" is used to indicate both hydrogen cyanide and cyanide ion in Japan.

77-0503. Goto, S. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan). [**Metabolism and degradation of pesticides in the environment.**] *Proc. Symp. Pestic. Sci.* 9: 29-30; 1976. (Japanese)

The qualitative and quantitative transformations of pesticides applied in the field and transported into the atmosphere, soil, biosphere, and hydrosphere were explained separately for each phase (shpere). The major factor in elimination of the pesticide in the upper atmosphere is apparently photolysis by UV. In closed systems such as in glass or vinyl greenhouses the contamination of air by pesticides which are then inhaled by cultivation workers could be serious. In soil, microbiological and chemical degradation are the major factors of elimination, with evaporation and photolysis. The fate of pesticides absorbed by the plant root system from soil depends greatly on the plant species and pesticide type. The fate of pesticide bound to soil and the interactions between various pesticides in soil will have to be further studied. The fate of pesticides applied in flooded paddy fields should be further studied, especially in Japan. The necessity of studying the effects of pesticides not only on adult fish (acute toxicity) but on their eggs and larvae was emphasized. Also, the necessity of studying the interaction of pesticides among themselves and with other chemical substances was emphasized.

77-0504. Raffke, W.; Wirthgen, G. (Hyg.-Inst. Berlin, 1055 Berlin, DDR). **Zur Rueckstandsbildung von Dichlorvos in Getreideerzeugnissen.** [**On the formation of dichlorvos residues in cereal products.**] *Nahrung* 20(1): 37-40; 1976. (4 references) (German)

The use of dichlorvos has been proposed in mill areas used for storing ground grain products. The degree of contamination of the food material being stored depends greatly on the method of application and the concentration of the agent and the temperature. The type of container housing the grain product is also of importance. In field experiments the highest residues were found when the flour was stored in open containers, second in cloth bags near the outside of a stack, third when in small ready-for-sale packages or in polyethylene bags, fourth in large sale units, and fifth in aluminum foil-covered polyethylene. Dichlorvos residues declined rapidly after application. Samples were free from dichlorvos residues after 3 hr when a high dichlorvos application rate was used or 1 hr at a lower application rate. Dichlorvos residues in flour stored in Petri dishes declined from 6 ppm initially to undetectable levels within 15 days.

77-0505. Engst, R.; Knoll, R.; Morzek-Drux, A.; Hocke, R. (Zentralinst. Ernaehl., Bergholz-Rehbruecke, DDR). **Chlorierte Kohlenwasserstoffe in der Tageskost.** [**Chlorinated hydrocarbons in the daily diet.**] *Nahrung* 20(4): 359-368; 1976. (29 references) (German)

Gas chromatographic analysis of the diets, excluding beverages, of men consuming at most 4000 kcal daily, in spring through autumn 1971, revealed chlorinated hydrocarbon residues. With an average food intake of 1635 g daily, each subject, with average body weight 65 kg, ingested 105 μg DDT, 20 μg DDE, 20 μg DDD (149 μg total DDT), and 10 μg lindane. This was below the ADI value recommended by the WHO/FAO. From winter 1971 through 1972, diets, including beverages, of children 1 to 3 years old, having average body weight 12 kg, were analyzed. The average food intake of 1230 g daily contained 42 μg DDT, 12 μg DDE, 8 μg DDD (64 μg total DDT), and 7 μg lindane. Total DDT intake was calculated at 5.3 μg/kg body weight, exceeding the ADI value for adults. The claim for a zero tolerance for foods is corroborated. Complete replacement of DDT with other insecticides is imperative from the viewpoint of health policy.

77-0506. Mikami, N.; Okawa, H.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Ind. Co., Ltd., Takarazuka, Hyogo, Japan). [**Photodecomposition of cyanfenphos (surecide), *O*-ethyl *O*-4-cyanophenyl phenylphosphonithioate and cyanophos (cyano) *O*,*O*-dimethyl *O*-4-cyanophenyl phosphorothioate.**] *Pestic. Sci.* 1(4): 273-381; 1976. (17 references)

Exposure of Cyanox and Surecide in acetone solution to UV light resulted in rapid decomposition. P=S was oxidized to P=O; cleavage of P-O-aryl and P-O-alkyl linkages, liberation of hydrogen cyanide and carbon dioxide,

and carboxylation of 4-cyanophenol were observed. Most of these photochemical processes were common to both organophosphorous compounds. Surecide and Cyanox were fairly stable in water when exposed to sunlight; 21.7% and 35% decomposed after 20-day exposure, respectively, and gradually were mostly converted into the oxon analogs, 4-cyanophenol and desmethyl cyanoxoxon. Both organophosphorus compounds decomposed rapidly on silica gel and soil thin-layer plates. Sunlight could significantly affect degradation of Cyanox and Surecide in the environment.

77-0507. Tsuge, S.; Kazano, H.; Tomizawa, C. (Agric. Chem. Inspect. Stn., Min. Agric. For., Kodaira, Tokyo, Japan). [**Some devices in a model ecosystem for volatile compounds and its application to carbaryl and *p,p'*-DDT.**] *J. Pestic. Sci.* 1(4): 307-311; 1976. (8 references)

A closed model ecosystem was designed to trap gaseous and volatile pesticide metabolites. Using this system, experiments on carbaryl and *p,p'*-DDT were performed. Recoveries of radioactivity were 62.1% for DDT and 51.4% for carbaryl. An aqueous NaOH trap recovered 25.1% of the initial radioactivity for carbaryl. Results for DDT showed a tendency similar to that previously reported. The closed model ecosystem was proved useful in studying probable pesticide behavior in the environment, particularly when parent compounds and metabolites are volatile and gaseous.

77-0508. Henriksson, K.; Karppanen, E. (Stat. Veterinarmed. Anst., Helsingfors, Norway). **Kvicksilverhalter hos duvhok (*Accipiter gentilis*) 1966 och 1974.** [**Mercury residues in goshawk (*Accipiter gentilis*) in 1966 and 1974.**] *Nord. Vet.-Med.* 27(12): 641-645; 1975. (5 references) (Norwegian)

A comparative study of muscle, liver, and kidney specimns from goshawks shot in 1966 and 1974 shows a significant decrease in mercury levels. Mean values in liver specimens decreased from 2.27 to 0.50 mg/kg, those in muscle specimens from 0.99 to 0.20 mg/kg, and those in kidney specimens from 3.06 to 0.57 mg/kg. This decrease is attributed to recommendations since 1969 to avoid using alkylmercurials as seed dressing.

77-0509. Sannikov, G. P.; Motuzinskii, N. F. (Northern Sci. Res. Inst. Hydrotech. Develop., USSR). **Effektivnost' i sanitarno-gigienicheskie usloviya primeneniya arboritsidov v zimnii period.** [**Efficacy and sanitary-hygienic conditions for use of arboricides in winter.**] *Khim. Sel. Khoz.* 13(1): 49-53; 1975. (27 references) (Russian)

Granular formulations of 2,4,5-T butyl ether, applied as arboricides in winter, are just as effective as when applied in the spring. Soil incorporation in winter is preferable because of the snow cover and the lower soil temperatures, which prevents dispersion in the environment. Contamination of other soil, water, and environmental materials is prevented. When applying 2,4-D butyl ether, the workers should pay especially close attention to strictly following the safety rules.

77-0510. Kiseleva, N. I. (All-Union Sci. Res. Inst. Hyg. Toxicol., USSR). **Vliyanie UF-izucheniya, temperatury i pH sredy na stonist' polikhlorpinena i polikhlorkamfena.** [**Effect of UV radiation, temperature, and pH of the medium on the stability of polychloropinene and polychlorocamphene.**] *Khim. Sel. Khoz.* 13(5): 372-374; 1975. (4 references) (Russian)

The effects of ultraviolet radiation and incubation at various temperatures as well as various pH values were examined on solutions of polychloropinene (strobane) and polychlorocamphene (toxaphene). As anticipated, degradation increased with increasing temperature and following exposure to UV light. Both preparations were stable in acid milieu (pH 1), and degraded rapidly at pH 11. Toxaphene degraded more readily under all conditions than strobane. Thin layer chromatography of a strobane solution after irradiation revealed two spots produced by degradation of starting material.

77-0511. Dzhafarli, F. M. (Azerbaijan Sci. Res. Inst. Plant Protect., USSR). **Ostatochyne kolichestva solana v pochve i rasteniyakh tomatov.** [**Solan residues in soil and tomato plants.**] *Khim. Sel. Khoz.* 14(5): 69-70; 1976. (8 references) (Russian)

The dynamics of solan disapperance from soil and tomato plants were examined in field experiments in the Kirovabad region. Solan was applied to the soil at 5 kg/ha on May 4, 1972, early in the tomato growing season. Residues were determined by thin layer chromatography. At 10 days after application solan was determined at 0.24 ppm in the 0-5 cm soil layer, 0.22 in the 5-10 cm layer, 0.17 ppm in the 10-20 cm layer, 0.12 ppm in the 20-30 cm layer, 0.10 ppm in the 30-40 cm layer, and 0.07 ppm in the 40-50 cm layer. Tomato leaves contained solan at 15 ppm. By day 40 after treatment the levels in the 0-5 cm and 5-10 cm layers were 0.12 and 0.11 ppm, while the 20-cm layer contained only traces of solan, and it was not detectable below 20 cm. By day 70 after application solan was detectable at 0.07 ppm only in the 0-5 cm soil layer and in tomato leaves and fruits. Solan was no longer detectable in any of the materials examined by day 85 after treatment.

77-0512. Karrick, N. L.; Gruger, E. H., Jr. (Northwest Fish. Cent., Natl. Mar. Fish. Serv., Seattle, WA 98112). **Pollution in the Northeast Pacific Ocean.** *Mar. Fish. Rev.* 38(11): 2-19; 1976. (64 references)

Contamination of the Northeast Pacific Ocean is generally thought to be less extensive than pollution of the Atlantic Ocean and other oceans of the world. However, contamination of this area exists, as evidenced for example by the levels of chlorinated hydrocarbons such as DDT and polychlorinated biphenyls in the fat and blubber of

marine mammals in the Northeast Pacific. It is unknown whether these residues are acquired in coastal waters or on the high seas. Reports on various types of pollution are reviewed with particular reference to the use of northwestern American coastal water as a receptacle for wastes from various human activities. The history of attempts to minimize coastal water pollution is also reviewed. Organochlorine compounds have been widely investigated in both naturally occurring and laboratory situations, and have served as warning substances.

77-0513. Corvi, C.; Vogel, J. (Lab. Canton. Chim., Geneva, Switzerland). **Residus de pesticides chlores dans les plantes aromatiques. [Organochlorine pesticide residues in herbs.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 67(2): 262-268; 1976. (4 references) (French)

Market or wild specimens of 25 herb species were analyzed for organochlorine residues. Residues were present in all 112 specimens examined. Some compounds, such as α-BHC, lindane, and DDT were present in almost all specimens, and others such as dieldrin and heptachlor epoxide in only a few. Residues in wild specimens were lower than those in cultivated specimens, where direct application or soil uptake following previous treatment was conceivable; however, even the wild herbs contained significant amounts of organochlorine pesticides. From 1% (α-BHC) to 40% (DDT, DDE) of the specimens contained residues in excess of 100 ppm.

77-0514. Richer, E. (Inst. Pharmacol. Toxicol. Pharm. Fachber. Tiermed., Univ. Muenchen, Munich, Germany). **Untersuchungen ueber den Hexachlorbenzolgehalt im Blut von Kindern aus Oberbayern. [HCB content in blood of children from Upper Bavaria.]** *Montasschr. Kinderheilkd.* 124(5): 494-495; 1976. (15 references) (German)

Blood specimens from 194 children, 1-18 years of age, were examined; 72 of the children lived in Munich, 59 in small cities (less than 10,000 population), and 63 in rural areas. Specimens were collected in Jan.-April 1975. HCB was detectable in all of the samples. The average concentration was 16.5 μg/kg. The lowest concentration of 2.8 μg/kg was measured in the case of a one-year-old boy from Munich, and the highest value of 77.9 μg/kg in a 7.5 year-old-boy, likewise from Munich. Blood HCB levels were significantly higher in boys than in girls, but no geographical differences were established. However, if the single extreme value for the city was eliminated the values for the city were significantly below those for the rural area. Infectious diseases appeared not to alter the blood HCB content. A tendency to increasing levels was seen with increasing age. The blood HCB content appeared to be adequately representative of the quantities stored in adipose tissue, according to body weight correlations with previous autopsy determinations. Analysis of chidlren's blood seems well suited for assessing the total contamination level in a population, since factors such as occupational exposure and certain metabolic alterations are eliminated.

77-0515. Jany, H.; Mueller, R.; Hofmann, S. (VEB Ausruest. Agrochem. Zent. Leipzig, Betriebsteil Schafstaedt, DDR). **Moeglichkeiten zur Deponierung, Beseitigung und Inaktivierung pflanzenschutzmittelhaltiger Waschwaesser und Restbruehen aus agrochemischen Zentren. [Possibilities of depositing, disposing and inactivating washings and residual quantities of spray-solutions containing plant protectives from agrochemical centres.]** *Nachr. Planzenschutzd. DDR* 30(5): 86-89; 1976. (German)

Toxic washings and residual amounts of spray solutions occurring when plant protection machinery is serviced in agrochemical centers must be collected in storage tanks with no drains and disposed of in a controlled manner. Currently, the waste waters are usually sprayed on cropland. Burning in industrial incinerators is recommended. Prelminary results were obtained regarding inactivation of waste waters that contain plant protectives in a chemical industry chemico-biological sewage disposal plant. The two-year tests indicate that efficient facilities can inactivate waste waters containing plant protectives. Other potential methods of hydrolyzing the toxic substances in waste waters and utilizing municipal biological sewage disposal plants must still be tested.

77-0516. Beitz, H.; Winkler, R.; Sichting, M.; Schmidt, H. (Inst. Pflanzenschutzforsch. Kleinmachnow, Biol. Zentralanst., Berlin, DDR). **Untersuchungen zur Erfassung der Grundwasserkontaminationsfaehigkeit ausgewaehlter Pflanzenschutzmittel. [Studies for recording the ground-water contamination capacity of selected plant protection substances.]** *Nachr. Pfanzenschutd. DDR* 30(5): 89-94; 1976. (11 references) (German)

The demands of environmental protection apply to crop production. Special attention must be paid to ground water. An account of the relationship between hydrogeological bedding and protection of ground water deposits from contamination is given. Model studies and field experiments were performed to investigate leaching of plant protection substances into ground water. These investigations indicated that dimethoate, 2,4-D, and dichlorprop were potential ground water contaminants. The factors that influence leaching of pesticide residues into the ground water are outlined. Attention is drawn to risks emanating from inappropriately disposing of waste waters. Conclusions for practical work are derived and standard values for land disposal of waste waters are recommended.

77-0517. Banasiak, U.; Beitz, H.; Bergner, U.; Weidenmueller, S. (Inst. Pflanzenschutzforsch. Kleinmachnow, DDR). **Karenzzeiten fuer die Halmstabilisatoren Chlormequat und Ethephon nach aviochemischem Einsatz. [Waiting periods after aviochemical application of the culm stabilizers chlormequat and ethephon.]** *Nachrichtenbl. Pflanzenschutzd. DDR* 30(5): 95-99; 1976. (15 references) (German)

Results are presented of investigations into ethephon and chlormequat residues in harvested winter

rye and winter wheat. Experiments were also performed investigating residue dynamics of these active substances on grain, ryegrass, alfalfa, rape, field peas, and cauliflower. Investigations conducted over several years revealed that, provided directions for using the formulations Camposan and Bercema-CCC are followed, the tolerance value for food grain, 0.5 ppm, is not exceeded and that whole plants, grain, and straw could be safely fed to animals. Results regarding residue dynamics of chlormequat indicate that accidentally treated crops require waiting periods of 14 and 28 days prior to feeding to non-lactating and lactating cattle, respectively. Two weeks was established as a waiting period for ethephon.

77-0518. Goedicke, H.-J.; Winkler, R. (Inst. Pflanzenschutzforsch. Kleinmachnow-Biol. Zentralanst. Berlin Akad. Landwirtschaftswiss. DDR, Kleinmachnow, DDR). **Zum Rueckstandsverhalten von Parathion-methyl-Formulierungen im Boden. [Residue dynamics of some methyl parathion formulations in soil.]** *Nachr. Pflanzenschutzd. DDR* 30(5): 100-101; 1976. (5 references) German)

Methyl parathion was applied to a sandy loam soil and a loess-based soil, and the residues were examined periodically thereafter. The initial level at the normal application rate amounted to about 5 ppm; only 0.3 to 0.8 ppm could be detected after 57 days. The more rapid degradation in the loess soil might have been due to its greater microbial activity or to lesser extents to its greater absorptive capacity and higher pH. Methyl parathion undergoes hydrolytic degradation more rapidly at higher pH. The half-life in Kleinmachnow sandy loam was plotted at 13 days and in Atzendorf soil at 5 days. Groundwater contamination should not occur at normal application levels.

77-0519. Beitz, H.; Dunsing, M.; Windschild, J.; Riebel, A. (Inst. Pflanzenschutzforsch., Kleinmachnow, DDR). **Zum Rueckstandsverhalten von Pflanzenschutzmitteln und Mitteln zur Steuerung biologischer Prozesse auf Ernteguetern waehrend der Vorratshaltung. [On the residue dynamics of plant protection substances and the products for controlling biological processes on harvested crops during storage.]** *Nachr. Pflanzenschutzd. DDR* 30(5): 101-105; 1976. (13 references) (German)

The characteristics of residue dynamics of substances for plant protection (pesticides) and products controlling biological processes on crops during storage are outlined. Examples point out factors which are especially effective with respect to formation of residues and their decline. Benomyl, carbendazim, chloramphenicol, chlorpropham, maneb, ethephon, quintozene, and zineb are discussed for dressing seed potatoes, dusting headed cabbage, dipping apples and tomatoes, and inhibiting potato sprouting. Finally, certain possibilities for reducing residues on food and feedstuffs are considered.

77-0520. Sauer, S.; Apelt, G. (Hyg.-Inst. Bez. Leipzig, DDR). **Zum Rueckstandsverhalten von Quintozen an Salat unter Folie. [Residue analysis of quintozene in lettuce grown in plastic greenhouses.]** *Nachr. Planzenschutzd. DDR* 30(5); 106; 1976. (1 reference) (German)

Persistence of quintozene (PCNB) in soil and uptake by lettuce plants was examined. Soil specimens collected prior to current-year qunitozene application contained residues of 0-18 ppm from the previous year. Residues in almost all plants harvested 6-9 wk after quintozene application at 20 g/m² exceeded the tolerance level of 1 ppm; the maximum at this application rate was 4.3 ppm. Residue levels appeared to be inversely correlated with plant weight at harvest and also with the quintozene levels in soil at the same time. It is recommended that qunitozene be used in the starter pots rather than in the bedding soil in order to avoid excessive residues.

77-0521. Dunsing, M.; Windschild, J. (Inst. Pflanzenschutzforsch., Kleinmachnow, DDR). **Rueckstaende von Quintozen, Hexachlorbenzol und Pentachloranilin in Salat und im Boden. [Residues of quintozene, hexachlorobenzene and pentachloroaniline in lettuce and soil.]** *Nachr. Pflanzenschutzd. DDR* 30(5): 106-108; 1976. (9 references) (German)

Hexachlorobenzene (HCB) is present at 1-6.2% in technical quintozene used as a greenhouse fungicide and has highly undesirable residue properties. The practice of applying quintozene (PCNB) to lettuce beds at 30 g/m² in the open air and in plastic greenhouses was investigated both in terms of the maintenance of the 1 ppm tolerance for quintozene and in terms of the HCB residue levels. Levels of the quintozene degradation product PCA (pentachloroaniline) were also considered. Quintozene residues on and in lettuce dropped from 60 ppm at 5 days after treatment with quintozene preparation at 30 g/m² to 10 ppm at 4 wk and almost zero at 7 wk. Within the same time period HCB residues declined from 3.5 ppm at 5 days to 0.6 ppm at 4 wk and undetectable at 7 wk. Quintozene was more persistent in plastic greenhouses than in glass greenhouses and was least persistent outdoors.

77-0522. Goedicke, H.-J.; Riebel, A.; Grubner, P.; Mende, G. (Inst. Pflanzenschutzforsch., Kleinmachnow, DDR). **Untersuchungen zum Rueckstandverhalten von Akariziden und Fungiziden in Gemuese unter Beruecksichtigung neuer Applikationsverfahren. [Investigation of the residue behavior of acaricides and fungicides on vegetables with due consideration of new ways of application.]** *Nachr. Pflanzenschutzd. DDR* 30(12): 250-253; 1976. (9 references) (German)

The effect of hot fogging and spraying of acaricides and fungicides on the residues on cucumbers and tomatoes grown in plastic greenhouses were investigated. Hot fogging resulted in approximately the same residues from chinomethionate (oxythioquinox), fenazon, thiram, benomyl, and dinocap on tomatoes or cucumbers as spraying, and the same waiting periods apply for the two

methods of application. For these active substances a four-day waiting period is recommended for vegetables. Due to the persistent high residues, treatment of lettuce with benomyl is allowed only within three weeks after planting.

77-0523. Dabrowski, J.; Czarnik, W. (Inst. Environ. Protect., Poznan, Poland). **Untersuchungen ueber die Rueckstaende von Benomyl in Champignons. [Investigations for benomyl residues in mushrooms.]** *Nachr. Pflanzenschutzd. DDR* 30(12): 254-256; 1976. (5 references) (German)

To protect mushrooms from mycoses, a systemic fungicide, Benlate (active ingredient benomyl) may be sprayed at 1 g in 100 to 500 ml of liquid per m^2. Benomyl residues are determined by UV spectroscopy. The highest residues found in two experiments were 0.5 and 0.7 ppm benomyl, within the 1.5 ppm tolerance recommended by the Codex Alimentarius.

77-0524. Foerstner, U. (Lab. Sedimentforsch., Univ. Heidelberg, Germany). **Lake sediments as indicators of heavy-metal pollution.** *Naturwissenschaften* 63(10): 465-470; 1976. (115 references)

Heavy metals present a threat to aquatic life and to human health via drinking water. They are among the most toxic environmental pollutants. Reports on heavy metal contamination of lake sediments are reviewed. Analysis of lake sediments provides a means for determining the origin, distribution, extent, and possible hazards of metal contamination. Sedimentary cores in particular provide the means for evaluating a variety of influential factors from natural sources and human activities. Sediment cores constitute a historical record of the metal accumulations which have occurred in past decades due to population growth and industrial development. Studies on the Wisconsin lakes have provided information on metal pollution resulting from the use of pesticides. For example, some lakes were treated intermittently with copper sulfate for algal growth in 1918-1944. Correlations with use of arsenical herbicides were also seen.

77-0525. Goldberg, E. D. (Scripps Inst. Oceanogr., Univ. California, San Diego, CA). **Pollution history of estuarine sediments.** *Oceanus* 19(5): 18-26; 1976. (8 references)

Estuarine sediments record the history of some changes wrought by human activities in the region where the fresh water meets the ocean. These changes may be easier to investigate then changes in marine ecosystems. A predictable succession of species seems to occur in an estuarine community subjected to an environmental stress, as has also been observed for terrestrial communities. Sewage outfalls deliver toxic substances into the coastal environment. One example of this process was provided by the discharge of DDT into the Los Angeles municipal waste system prior to 1972. Atmospheric fallout and agricultural runoff also contributed several tons of DDT per year to the coastal burden. Measurable quantities of DDT degradation products appear in the sediment strata deposited after 1945. PCBs have also been detected beginning in the 1945 strata. Restriction of DDT and PCB use was followed by decreasing sediment levels.

77-0526. Gontovaya, N. A.; Rusnak, B. S.; Sheiman, A. M.; Platonova, E. V. (Author address not given). **Ostatochnye kolichestva DDT i GKhTsG v pishchevykh produktakh dvikh sel'skikh mikrorayonov Moldavii. [Residual DDT and hexachlorocyclohexane in the food products of two agricultural microregions of Moldavyia.]** *Okhr. Prir. Mold.* 10: 146-150; 1972. (10 references) (Russian)

The Ministry of Public Health of the USSR commissioned an analysis of food products for DDT and BHC, comprising 2040 analyses for the former and 1990 for the latter. The specimens were taken from two agricultural microregions in Moldavia, one with a history of intensive pesticide use and one with moderate quantities. Twenty-seven food products were examined. DDT was present in specimens of 23 food products from the first region and 20 from the second. The three-year average pesticide concentration from the first microregion was 0.002-0.16 mg/kg and from the second 0.08 mg/kg. DDT was especially prevalent in fruit products. BHC was detected in 23 of the 27 food types tested from both regions. BHC was not generally present in fruits, in contrast to DDT.

77-0527. Zislavsky, W. (Bundesanst. Pflanzensch., Vienna, Austria). **Untersuchungen von Futtermitteln auf Pflanzenschutzmittelrueckstaende. [Examination of animal feeds for pesticide residues.]** *Pflanzenarzt* 26(12): 118-121; 1973. (German)

It is in the interest of food producers to monitor pesticide levels not only to protect consumers in their own land but also to satisfy import regulations of potential purchasers. Therefore not only the final product but also potential pesticide sources, e.g., cattle feed in the case of dairy products, should be inspected. Analyses were performed by the Austrian government in this connection in 1971-72. Almost all of the feed components examined contained lindane at 1 ppb or more. The DDT group, including the degradation products DDD and DDE, was present at 1 ppb or more in about 70% of the components and 80% of the mixed feeds. Aldrin and dieldrin were present at 1 ppb or more in ca. 75% of all samples, whereas the fungicide PCNB was present in only about 25%. Heptachlor was detected only in one specimen. HCB traces were detected in many products following establishment of its identity; this is presumably due to both industrial and agricultural use.

77-0528. Kontek, M.; Paradowski, S.; Olek, L.; Tyc, M.; Glogowski, K. (Cardiol. Clin., Inst. Intern. Med., Acad. Med., Poznan, Poland). **Wyply glodzenia pooperacyinego i leczniczego na zawartosc weglowodorow**

chlorowanych we krwi osob nie stykajacych sie zawodowo z pestycydami. [Effect of postoperative and therapeutic starvation on chlorinated hydrocarbon levels in blood of patients without occupational exposure to pesticides.] *Pol. Tyg. Lek.* 31(38): 1639-1640; 1976. (5 references) (Polish)

Levels of BHC, *p,p'*-DDT, *o,p'*-DDT, and *p,p'*-DDE were determined in the blood of 16 men and 10 women before operation and after operation followed by four days of starvation. The levels were similarly determined in three women with simple obesity who were treated with a low calorie diet for 14 days. The mean weight loss in the first case was 2 kg and in the second case 6 kg. Average levels before operation were: BHC 2.0 μg/l, *p,p'*-DDT 7.28 μg/l, *p,p'*-DDE 18.39 μg/l, *o,p'*-DDT μg/l, and total DDT 26.12 μg/l. Average levels after operation (in the same order) were 2.1, 7.37, 18.57, 0.68, and 26.32, thus no significant increase was seen. Similar findings were obtained for the therapeutically starved group.

77-0529. Przybylski, Z. (Inst. Environ. Protect., Poznan, Poland). **Toksykologiczne wlasciwosci lindanu a problem ochrony srodowiska czlowieka. [Toxicologic properties of lindane and the problem of environmental protection.]** *Postepy Nauk Roln.* 21(1): 71-83; 1974. (5 references) (Polish)

Problems relating to the toxicologic and environmental effects of lindane were discussed at a symposium sponsored by the International Center for Studies of Lindane, Brussels, Belgium. Reports primarily related to three topics: lindane and environmental protection, toxicologic properties of lindane, and lindane residues in the living human environment. Sources and levels of lindane are discussed. Lindane is of moderate toxicity and is not likely to provoke allergic reactions. Lindane disappears far more rapidly than DDT following application. Analysis of foodstuffs in Poland revealed lindane ingestion at less than 0.001 mg/day/person from dairy products, 0.001 mg/day/person from meat, poultry, and fish, 0.004 mg/day/person from cereal products, and less than 0.001 ppm from fruits and vegetables.

77-0530. McConnell, G. (ICI Ltd., Mond Div., Research Develop. Dep., England). **Halo organics in water supplies.** *J. Inst. Water Eng. Sci.* 30(8): 431-445; 1976. (79 references)

The use of chlorine for water sterilization results in the formation of organochlorine compounds, and such compounds may also be introduced from numerous other sources, sometimes resulting in disagreeable tastes and odors. For this reason and because of their easy gas chromatographic detection and bioaccumulation the organohalogen compounds have received a great deal of attention as water pollutants. These contaminants include organochlorine insecticides and PCBs, introduced by agricultural use or industrial discharges; simple aliphatic chlorinated hydrocarbons, possibly introduced by transfer processes with the atmosphere, and possibly of biological origin; aromatic chlorohydrocarbons which are once again primarily pesticides or their degradation products; and halo-organics formed during water chlorination treatment. Concern is shifting from the insecticides to the more volatile chlorine derivatives of methane, ethane, and ethylene because of their possible contribution to destruction of the ozone layer if they enter the stratosphere and the suspected carcinogenicity of some organohalide compounds.

77-0531. McManus, J. A. (Water Dep., New Britain, CT). **Some water supply contaminants from watershed developments.** *J. New England Water Works Assoc.* 90(4): 341-353; 1976.

Water supply management in the era prior to chlorination mainly comprised preventing unauthorized access to watersheds. Consistent use and protection of upland watersheds has prevented many problems in New England, but two problems were recently detected. One was runoff from orchards, which were formerly considered harmless to watersheds. However, increasing quantities of growing variety of pesticides are being used in orchards today; the owner of the orchard abounding one watershed says he now uses 16 preparations with various active ingredients and formulation aids. No evidence of excessive pesticide levels in water from this area has been obtained, but higher than normal pesticide quantities were found in the mud along the shore of the reservoir nearest the orchard. Levels found were correlated with use practice; for example, parathion in mud diminished from 0.87 mg/kg to 0.22 mg/kg in two years following cessation of its use. Substitution of a chromium-containing pesticide for the proper chromium-free formulation resulted in appreciable chromium accumulation, rising from 12 mg/kg to 34 mg/kg over a two-year period. The other unexpected contamination source was runoff from roads and parking lots.

77-0532. Cocisium, M.; Aizicovici, H.; Nistor, C.; Unterman, H. W.; Barbuta, R.; Gugles, E. (Inst. Ig. San. Pub., Iasi, Romania). **Variatia continutului in DDT si HCH al laptelui matern in corelatie cu aportul lor prin alimentatie. [Variation of the DDT and HCH contents of maternal milk in connection with food intake.]** *Igiena* 25(2): 105-108; 1976. (13 references) (Romanian)

The HCH (BHC) and DDT content of the secreted milk was examined in 33 women during their lactation periods. The amount of HCH and DDT in the foods they ingested was also studied. The residues of the two insecticides in mother's milk displayed significant variations, both in different donors and in the same subjects. The investigations indicated that, on the average, with ingestion of 0.314 mg DDT and 0.096 mg HCH, the excretion through the mothers' milk amounted to 0.452 mg DDT and 0.108 mg HCH. The presence of a higher amount of insecticides in maternal milk, compared with the amount introduced in the food, was due to previously accumulated insecticides.

See also **77-0556** **77-0557**

77-0533. Jirasek, L.; Kalensky, J.; Kubec, K.; Pazderova, J.; Lukas, E. (II. Dermatol. Clin., Fac. Gen. Med., Karlovy Univ., Prague, Czechoslovakia). **Chlorakne, Porphyria cutanea tarda und andere Intoxikationen durch Herbizide. [Chloracne, porphyria cutane tarda and other herbicide induced intoxications.]** *Hautarzt* 27(7): 328-333; 1976. (44 references) (German)

Signs and symptoms of dioxin intoxication were seen in 80 employees of a plant manufacturing 2,4,5-T and sodium pentachlorophenate (PCP) in Czechoslovakia. A large range of abnormalities were seen. Chloracne and porphyria cutanea tarda were the most obvious and widespread symptoms. Biochemical abnormalities included disorders in the metabolism of porphyrins, fats, carbohydrates, and plasma proteins. Neurological manifestations were mostly lesions of the peripheral nervous system. Psychiatric disorders included neurasthenic syndrome and organic lesions. Some deviations from the usual course of chloracne were observed. One patient developed severe atherosclerosis and died at the age of 57 with hypertension, diabetes mellitus, abnormal EEG, brain damage, and finally purulent bronchoneumonia. Many patients developed polyneuropathy, as verified by both EMG and autospy. Two patients died of bronchogenic carcinoma. One patient died of acute intoxication prior to the appearance of chloracne cases, and thus the possibility of dioxin poisoning was not recognized. A very large number of drugs and treatments was tried, to little avail. The best results in chloracne were obtained by sauna bathing followed by an acne cleansing regimen. The patients have now been followed up for eight years since the chloracne was discovered.

77-0534. Manasia, M.; Zamora, C.; Vinti, D.; Saroiu, I. (I. Med. Clin. I.M.F., Cluj-Napoca, Romania). **Intoxicatii acute complicate cu insuficienta renala acuta. [Acute intoxications complicated by acute renal failure.]** *Igiena* 25(2): 147-154; 1976. (16 references) (Romanian)

Observations were made of 12 patients suffering acute intoxication from carbon tetrachloride, insecticides and fungicides complicated by renal failure of the acute type. The etiological conditions were analyzed, as well as the anatomo-pathological and pathophysiological aspects, stressing the hepatic involvement in the morbid processes. The lack of specificity of the initial symptoms of these intoxications prevented, in 7 of the 12 cases, the correct diagnosis from being reached. Intoxications with carbon tetrachloride (5 cases) had a variable evolution only under a complex treatment of hydroelectrolytic reequilibration, while intoxications with insecticides and fungicides (7 cases) have necessitated extrarenal hemodialysis (4 cases). Negative evolution was noted in 3 cases, one of which was due to insecticides and two to heavy metals.

77-0535. Jeffery, W. H.; Ahlin, T. A.; Goren, C.; Hardy, W. R. (Coll. Pharm., Univ. New Mexico, Albuquerque, NM 87131). **Loss of warfarin effect after occupational insecticide exposure.** *J. Am. Med. Assoc.* 236(25): 2881-2882; 1976. (3 references)

A 53-year-old rancher was receiving outpatient treatment for thrombophlebitis consisting of 7.5 mg warfarin sodium daily. After stabilization on this treatment for 6 mo he was found to have a prothrombin time of 14 sec in May 1974. Warfarin therapy was discontinued for a year due to the minimal risk of disease recurrence and the difficulty of laboratory control of therapy. In May of 1975 the patient was readmitted with thrombophlebitis; at this time administration of warfarin sodium at 15 mg/day had no effect on his prothrombin time. He was given heparin sodium to take by subcutaneous injection at home. He stated at this time that he dusted his sheep each spring with a preparation containing 5% toxaphene and 1% lindane. Sheep were dusted by hitting them with a bag of insecticide dust within an enclosed barn. Return of warfarin responsiveness was carefully monitored, and entered the normal range about 3 mo after insecticide exposure.

77-0536. Lawson, G. (Dade County Dep. Environ. Resour., Miami, FL). **Pesticides pose disposal problem in Florida agricultural area.** *J. Environ. Health* 39(2): 80-82; 1976. (12 references)

During excavation for installation of a sewer main in southern Florida a cache of pesticide containers, some still containing pesticides, was unearthed. When the area became permeated with a pesticide odor emergency decontamination procedures were initiated. The area was treated with a slurry of sodium bicarbonate and activated charcoal and all the containers were moved. Samples from one partially filled container were analyzed and comprised 3.25% parathion. Six soil samples taken from the trench two weeks after decontamination were negative for pesticides. The southern half of Florida has an especially high potential for groundwater contamination because the surface limestone making up the Biscayne Aquifer is close to the surface. Numerous shallow wells drawing from the aquifer are the main water sources for the county. Various methods of disposing of unwanted pesticides are assessed.

77-0537. Lande, S. S. (Syracuse Res. Corp., Syracuse, NY). **Local guidelines for disposal of unwanted pesticides and empty pesticide containers.** *J. Environ. Health* 39(2): 87-89; 1976. (9 references)

Allegheny County, Pennsylvania, has developed a plan for disposal of unwanted pesticides and pesticide containers based on EPA guidelines as applied to local conditions. Any planned hazardous waste disposal in Allegheny County requires approval by state and county agencies. Most solid wastes including hazardous wastes are landfilled. None of the available incinerators is capable of safely destroying pesticides. Information regarding pesticide use was gathered at this time, and led to the conclusion that the public and environmental health problems posed by pesticides in Allegheny County are not as great as those posed by other hazardous wastes. Professional pesticide applicators stated that they always used up all the

active ingredients they employed and disposed of only the empty containers. A copy of the recommended local guidelines is reproduced. Disposal with trash is recommended for small quantities of unwanted products by householders. Guidelines for nonhousehold use were written to fit the local health department's enforcement capability.

77-0538. Lawhorne, L. (Inst. Agric. Med., Dep. Prevent Med., Coll. Med., Univ. Iowa, Iowa City, IA). **The health of farmers.** *J. Iowa Med. Soc.* 66(10): 409-418; 1976.

Occupational diseases associated with farming are summarized. Mechanical injuries are most common, especially cuts and bruises, but also including fractures, puncture wounds and burns. Noise, vibration, fumes, and animal contact also present special problems. Pesticide problems are not treated in detail in the text since the problem of poisoning has not reached the same magnitude in Iowa as in other areas where more contact occurs with sprayed plants and fruits. However, any physician practicing in an agricultural area should know the basic pharmacology of the pesticides employed in his area and make sure that his office and emergency room are equipped to handle intoxications by pesticides and other substances. Special inserts summarize activites of the Institute of Agricultural Medicine in the areas of toxicology (pesticides), comparative medicine, and farm accident prevention. A manual of emergency care in cases of pesticide poisonings has been prepared and when available it will be distributed to Iowa physicians upon request. The Toxicology Section would like to be informed of injuries or poisonings possibly or definitely caused by pesticides.

77-0539. Kennedy, P.; Cavanagh, J. B. (M.R.C. Res. Group Appl. Neurobiol., Inst. Neurol., London, England). **Spinal changes in the neuropathy of thallium poisoning.** *J. Neurol. Sci.* (29): 295-301; 1976. (35 references)

In a previous study of thallium neuropathy the possibility of extensive nervous degeneration was raised by postmortem examination of one victim four days after death. The nervous system of another victim, examined within one day after death, was therefore studied in detail. The victim, a 32-year-old male pest control operator, developed the typical peripheral neuropathy, skin rash, and alopecia, and died 19 days after the onset of neurological symptoms. Extensive areas of edema, hemorrhage, and recent necrosis were found in the subthalamic regions, in the substantia nigra on both sides, and across both corticospinal pathways. Early microglial and astrocytic changes suggested these lesions were recent. Chromatolysis was marked in the facial and hypoglossal nuclei but was not seen in the oculomotor or vagal nuclei. There was marked glial activation in the gracile and cuneate nuclei. There were well marked classical chromatolytic changes in many lumbosacral neurones. In the dorsal columns of the spinal tracts a revealing pattern of degeneration was seen at different levels. Very severe reduction of nerve fibers was seen in median, ulnar and sural nerves.

77-0540. Schaumburg, H. H.; Spencer, P. S. (Neurotoxicol. Unit, Albert Einstein Coll. Med., New York, NY 14601). **The neurology and neuropathology of the occupational neuropathies.** *J. Occup. Med.* 18(11): 739-742; 1976. (8 references)

Recent advances in experimental neuropathology have made possible a classification of human neuropathies based on histopathological reactions of peripheral nerve. The basic anatomy and pathology of peripheral nerve are surveyed and correlated with the clinico-pathological phenomena observed in some occupational neuropathies. The principal types of polyneuropathies are demyelinating neuropathies, chronic neuropathies (often hereditary), vascular neuropathies, and neuropathies in which the axon and nerve cell body are primarily affected. The majority of the occupational neuropathies are caused by neurotoxins in the work area, and the clinico-pathological prolifes indicate that these neuropathies conform to the axonal type. The degree of change is proportional to the duration and level of exposure in most cases. Some of the compounds causing occupational neuropathies provide excellent experimental models for these conditions. Unusual clinical features may aid in early identification of some of the neuropathies, e.g., severe gastrointestinal symptoms and spasticity in TOCP intoxication.

77-0541. Gardiner, J. S. (ICI Ltd., Organics Div., Blackley, England). **Health care of people at work. The toxicological screening of industrial chemicals.** *J. Soc. Occup. Med.* 27(1): 13-19; 1977. (10 references)

The chemical industry has the responsibility to ensure that the substances supplied are safe and without risk to health when properly employed. This may require animal or in vitro testing, an information service, a knowledge of the chemical and physical properties of the material, and an awareness of the possibility of human exposure. It seems that no totally reliable method or series of methods exists for toxicological screening of industrial chemicals. Some animal and in vitro testing has been thoroughly evaluated and is suitable for continuing use by workers who thoroughly understand the tests and their limitations. Recently developed short term in vitro tests seem very promising though they will not replace long term tests. The occupational health physician can play a key role in extrapolating laboratory data to a human situation at a manufacturing plant.

77-0542. Pelfrene, A. (Eppley Inst. Res. Cancer. Univ. Nebraska Med. Cent., Omaha, NB). **Arsenic and cancer: the still unanswered question.** *J. Toxicol. Environ. Health* 1(6): 1003-1006; 1976. (70 references)

Arsenic has been considered an important

therapeutic material for years. However, since a link with cancer was suggested during the nineteenth century, a controversy has raged regarding the carcinogenicity of arsenic compounds. Epidemiologic surveys suggested that arsenic induces lung, liver, or skin tumors in humans. On the other hand, experimental attempts to reproduce the neoplasms in laboratory animals have consistently failed, thus do not support the epidemiologic data in humans. A report recently attributed a mutagenic effect to arsenic, but the inconsistency of most mutagenesis findings at present makes this questionable also. There has also been a recent trend to consider arsenic beneficial in controlling tumors and aiding the health of farm animals.

77-0543. Schuster, H. P.; Schoenborn, H.; Bork, R.; Schuster, C. J. (II. Med. Klin. Poliklin., Univ. Mainz, Mainz, Germany). **Akute exogene Intoxikationen. Erscheinungsformen und Sofortmassnahmen.** [**Acute xenobiotic poisonings. Symptomatology and first aid.**] *Med. Klin.* 71(26): 1125-1134; 1976. (74 references) (German)

Poisoning cases account for at least 5% of admissions to pediatric and medical clinics at present, and for 15-20% of ambulance pickups in Germany. Drugs account for by far the greatest fraction of these poisoning cases, followed at some distance by toxic household materials, occupational and chemical poisoning, items of food and drink (including tobacco etc.), and pesticides. First aid, diagnosis, poison elimination, and antidotes are described for general application and for certain specific poisons. Particular mention is made of diagnosis and treatment of poisoning by paraquat and diquat as well as alkyl phosphate insecticides.

77-0544. Neu, J. (Neurol. Klin. Poliklin., Univ. Munich, Klin. Grosshadern, Munich, Germany). **Der Kopfschmerz aus exogen-toxikologischer Sicht.** [**Headache from the viewpoint of xenobiotic toxicity.**] *Med. Klin.* 71(30): 1244-1247; 1976. (18 references) (German)

The Bavarian beer purity ordinance of 1487, passed after Duke Albrecht IV and his court suffered severe headaches following consumption of adulterated beer, was apparently the first law aimed at preventing food poisoning. Various ingested or consumed products resulting from modern living can cause headaches or other nervous system manifestations. Headaches may be among the early symptoms of poisoning by lead, thallium, and mercury. At the present time DDT pollution of the Baltic Sea is threatening the biological equilibrium in this area. An unusual type of headache occurred years before other symptoms of DDT intoxication in the Baltic coastal area. Acute parathion poisoning usually presents a classic pattern of symptoms, while chronic poisoning is often difficult to diagnose. A patient was admitted to the Harlaching hospital after suffering for several days with headache, nausea, and progressive paralysis of the extremities. Progressive clouding of consciousness, miosis, and fasciculations suggested organophosphate poisoning. The patient's condition improved upon administration of atropine and cholinesterase reactivators. It was subsequently learned that the patient had used an empty parathion container to hold water for washing her paintbrush, and that she often put her paintbrush in her mouth.

77-0545. Rappe, A. (Soc. Etudes Ornithol. AVES, Brussels, Belgium). **Notes sur l'usage abusif des pesticides.** [**Misuse of pesticides.**] *Nat. Belg.* 54(8): 357-365; 1973. (17 references) (French)

In view of the demonstrated potential of pesticides for producing severe ecological damage and biological imbalance, it is recommended that the use of pesticides be limited or prohibited unless absolutely necessary. This particularly applies to the use of herbicides for controlling weeds along rights of way, which has the potential for excessive pollution and is not essential. Where pesticides are actually needed their effects should be closely monitored. Toxic levels of various pesticides to beneficial species are reviewed.

77-0546. McQueen, E. G. (Nat. Poisons Inform. Cent., Dunedin, New Zealand). **Paraquat poisoning.** *N. Z. Med. J.* 84(571): 208-209; 1976.

A Letter-to-the-Editor describes a round table discussion on the paraquat problem following the Colloquium on Toxicology held at Dunedin, New Zealand. Experimental work on paraquat poisoning has advanced, but some questions remain unresolved. Other bipyridyl herbicides such as diquat are not as effective in damaging the lung as paraquat, although they share its redox properties. Paraquat toxicity is synergistic with oxygen and involves the components of the glutathione peroxidase system. Measures that might be taken to reduce the likelihood of accidental paraquat poisoning include addition of pyridine to impart an unpleasant smell to the formulations and coloring and thickening the formulations. The main principle of current paraquat poisoning management is sequestration of ingested paraquat by administration of clay and its removal from the body in order to prevent continued reabsorption into the blood stream. Hemodialysis may be advisable if large amounts of paraquat have been ingested. The use of antioxidants is currently under investigation. The recommendations from the conference have been incorporated in the data sheet on paraquat poisoning at the National Poisons Information Center of New Zealand.

77-0547. Cortez Pimental, J.; Pixoto de Menenzes, A. (Serv. Anat. Patol., Hosp. Pulido Valente, Portugal). **Doenca hepatica em sulfatadores de vinhas.** [**Liver damage in vineyard fungicide applicators.**] *J. Med. (Lisbon)* 90(1693): 409-415; 1976. (39 references) (Portuguese)

Hepatic damage was seen at autopsy in 30 farm workers who presented symptoms of "grape grower's lung". Liver damage was manifest in various forms and combinations of manifestations: swelling and proliferation, focal or diffuse, of the Kupffer cells; histiocytic and

sarcoid granulomas; fibrosis of variable extent and of perisinusoidal, portal, or subcapsular localization, sometimes accompanied by atypical proliferation of the cells of the sinus linings; micronodular cirrhosis; liver angiosarcoma; and idiopathic portal hypertension. The presence of copper deposits within the lesions as demonstrated by histochemical methods suggests the existence of a close etiologic relationship between exposure to copper sulfate for periods varying from 3 to 35 years and the changes observed. The liver lesions in these cases resembled those previously described in workers exposed to inorganic arsenic and vinyl chloride.

77-0548. Mearns, A. J.; Sherwood, M. J. (S. Calif. Coastal Wastewater Res. Proj., El Segundo, CA). **Ocean wastewater discharge and tumors in a Southern California flatfish.** *Progr. Exper. Tumor Res.* 20: 75-85; 1976. (14 references)

The coastal waters have been traditionally used as a repository for human wastes. Much concern has been generated by the presence of tumor-bearing fishes in Southern California coastal waters and the possible correlation of this finding with water pollution. Fish were collected from a 100 km section of southern California coastline, and summaries of fish abundance and disease frequencies were prepared in relation to size, location, and season. The Dover sole was the only species of demersal, trawl-caught fish consistently affected with epidermal tumors. The prevalence of tumor-bearing individuals is highest in young fish (9%) and drops to about 2% within 8 months after the juveniles have settled out of the plankton. The distribution of contaminants in marine sediments has been thoroughly mapped in this coastal area. Levels of DDT and copper were tabulated in sediments around five major outfall systems and in Dover sole collected near these systems and from a control area. When sufficient numbers of Dover sole were collected to allow comparison of tumor prevalences in different areas there appeared to be no gradients in the distribution of tumor-bearing specimens. The distribution of tumor-bearing individuals differs distinctly from that previously seen for Dover sole with eroded fins, in which affected fish are strongly concentrated on the Palos Verdes shelf.

77-0549. Tomita, I. (Yame City, Fukuoka, Japan). [**Ocular injury by an acaricide, polyactins plus *O-sec*-butylphenyl *N*-methylcarbamate.**] *Kurume Igakkai Zasshi (J. Kurume Med. Assoc.)* 39(9): 769; 1976. (Japanese)

Experiences in 5 cases of ocular injury due to an acaricide, Miticidin-B (an emulsifiable mixture of polyactin antibiotic complex, and *o-sec*-butylphenyl *N*-methylcarbamate) was described. All the cases showed symptoms comprising ablation of corneal epithelium and edematous cloudiness of the corneal parenchyma. Treatment by eye irrigation with FAD and glutathione plus oral administration of vitamin B2 and lysozyme chloride was effective, and all the patients recovered within 4-5 days after the occurrence. Although the labeling of this acaricide indicates that its ocular hazard is slight and injured eyes will recover in 1-2 days with appropriate treatment, actually the injury was severest at 1-2 days after contact. A more exact description of the possible injury should be written in the instruction sheet.

77-0550. Luzhnikov, E. A.; Yaroslavsky, A A.; Molodenkov, M. N.; Shurkalin, B. K.; Evseev, N. G.; Barsukov, U. F. (Natl. Poisoning Treat. Cent., Sklifosovsky Inst. Emerg. Care, Moscow, USSR). **Plasma perfusion through charcoal in methyl parathion poisoning.** *Lancet* 1(8001): 38-39; 1977. (1 reference)

Plasma perfusion through uncoated charcoal proved very effective in 3 patients with severe metaphos (methyl parathion) intoxication. Continuous plasmapheresis was performed in a blood separator with columns containing charcoal incorporated into the plasma line. A seventy-year-old man was treated 3 hours after ingestion of 100 ml of metaphos. His blood cholinesterase activity was 39.5% of normal and the blood metaphos concentration was 33 μg/dl. He was treated with cholinomimetics, a cholinesterase reactivator, and forced diuresis. After perfusion of 3650 ml of plasma, the blood metaphos concentration fell to 8.8 μg/dl, and the patient's condition improved dramatically. Similar results were achieved with a seventeen-year-old man who was treated 60 minutes after consumption of 100 ml of metaphos (blood concentration 300 μg/dl, blood cholinesterase activity 20.8% of normal), and a 25-year-old man treated 4 hours after ingesting 400 ml of metaphos (blood concentration 480 μg/dl, blood cholinesterase activity 12.5% of normal, patient in deep coma). No side effects of plasma perfusion were observed, except for a slight chill at the beginning, and there was none of the blood cell damage that occurs with hemoperfusion. No changes in arterial or venous blood pressure were noted and the plasma platelet count did not fall.

77-0551. Lloyd, E. L. (Dep. Anesthesiol., Roy. Infirm., Edinburgh, Scotland). **Ascorbic acid and paraquat toxicity.** *Lancet* 2(7997): 1255; 1976. (4 references)

The possibility of preventing the onset of paraquat lung by the use of a reducing agent (ascorbic acid) in combination with measures to reduce the amount of oxygen in inspired air is discussed. The pulmonary toxicity of paraquat appears to depend on the production of superoxide radicals similar to those produced by hyperbaric oxygen. Ascorbic acid, sympatholytic agents, pentobarbitone, and other anesthetic agents that protect against the toxicity of hyperbaric oxygen might be used against paraquat poisoning. In denervated lamb lungs, the onset of oxygen toxicity can be altered by the second gas; the lighter gases (e.g., helium) increase toxicity, and the heavier gases (e.g., sulfur hexafluoride) reduce it. The use of an appropriate second gas might help paraquat victims by reducing the percentage of oxygen in the lungs.

77-0552. Takahashi, W.; Reichert, E. R.; Fung, G. C.; Hokama, Y. (Dep. Pathol., Univ. Hawaii Sch. Med., Honolulu, HI). **Acute phase proteins and pesticide exposure.** *Life Sci.* 19(11): 1645-1652; 1976. (21 references)

Gamma mobility C-reactive protein (CRP) level was determined in the sera of persons occupationally exposed to pesticides and controls in conjunction with serum protein analysis and other biochemical and enzymologic tests. Workers chronically exposed to dieldrin and pentachlorophenol showed significantly higher prevalence of CRP than the unexposed persons. In addition, the pentachlorophenol-exposed subjects revealed significantly elevated levels of total bilirubin and creatine phosphokinase, although the levels were within normal limits. The results suggest that chronic exposure to pentachlorophenol may have been responsible for the difference in the prevalence of CRP between the pentachlorophenol and control groups. (Author abstract by permission)

77-0553. Reimer, B. (VEB Chemiekombinat Bitterfeld, DDR). **Explosions- und Brandgefahren beim Umgang mit chlorathaltigen Pflanzenschutzmitteln. [Risks of explosion and fire on handling plant protectives containing chlorate.]** *Nachr. Pflanzenschutzd. DDR* 30(10): 202-205; 1976. (1 reference) (German)

Textiles soaked with mixtures that combine Agrosan (sodium chlorate) and Anforstan (potassium chlorate) with Wofatox-Konzentrat 50 (methyl parathion) are capable of explosive combustion at room temperature; the unabsorbed chemicals or their active ingredients, in contact with one another, are combustible at temperatures reached on a hot summer day. The transportation, storage, and use of these materials must be designed to prevent their coming into contact with one another, and contaminated clothing should be removed and cleaned or destroyed.

77-0554. Sugaya, H. (Inst. Rural Med., Usuda, Nagano, Japan). **[Intoxication by pesticides.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 25(special issue): 82-83; 1976. (Japanese)

Pesticides application in Japan began with DDT, BHC, parathion, and TEPP after World War II, and resulted in an average of 1000 cases/year of intoxication including 700 deaths/year between 1958 and 1970. More recently discovered problems of the teratogenicity of 2,4,5-T and aplastic anemia as well as experimental carcinogenicity caused by BHC and DDT were described. In Japan, the total number of pesticide intoxications rose to 1078 cases during 6 years including 1975. The incidence of intoxication was 63% during application, 16% after application, 13% due to attempted suicide, and 6% due to accidental ingestion. The pesticides which caused intoxication were 30% organophosphorus, 15% herbicides, and 10% organosulfur. Health hazards for professional pesticide applicators (drivers of pesticide speed sprayers) are not considered for causes other than pesticides. Environmental pollution by pesticides was manifested by β-BHC residues in human adipose tissue of 2.957 (Nagano Prefecture) and 2.991 ppm (Akita Prefecture). More recent problems include paraquat intoxication, dermatitis due to organosulfur pesticides, long-term inhibition of blood cholinesterase activity, and persistent morphological changes in nerve endplates due to so-called low-toxicity organophosphates, as well as slow alpha wave activity in the EEG of pesticide applicators and experimental animals and also allergies possibly due to pesticides.

77-0555. Boocock, D. **British pesticide scheme based upon cooperation.** *Pest Contr.* 44(7): 18-20; 1976. (5 references)

The use of pesticides in Britain is controled largely by the voluntary Pesticides Safety Precautions Scheme, under which manufacturers, formulators, importers, and trasnporters of pesticides agree to give notice of the introduction of new pesticides into the British market and of any change in the use or formulation of existing products. Notification is to one of three technical secretaries employed by the government, who process the new information through a series of administrative and scientific committees that decide on the safety of the action proposed by trade or industry. The committees draft "Recommendations for Safe Use" and give the proposed action one of 4 kinds of clearance, each with its own proscriptions on the marketing and use of the pesticides involved. The history of major pesticides poisoning incidents and legislation is briefly reviewed.

77-0556. Bielski, J.; Madra, B. (Inst. Intern. Med., Acad. Med., Poznan, Poland). **Ostre zatrucia pestycydami. [Acute poisoning with pesticides.]** *Pol. Tyg. Lek.* 31(46): 1971-1973; 1976. (19 references) (Polish)

Epidemiological and clinical data concerning 69 cases of accidental, occupational, and suicidal acute poisoning with pesticides are discussed. Diagnostic difficulties in the initial stage of intoxication by halogen derivatives due to the lack of rapid laboratory methods and confusion with the symptoms of other diseases are reported, with emphasis on nervous system effects. Derivatives of chlorophenoxycarboxylic acids, although classified as relatively safe (toxicity class III), were found to cause damage to the central nervous system. About 57% of the poisonings were intentional, with a severe course and high mortality; occupational poisonings (29%) were less severe and rarely lethal. Most victims were from rural areas (84%); treatment was effective in 90% of the poisonings.

77-0557. Niemirycz, E.; Rybinski, J. (Dep. Coastal Water Protect., Inst. Meteorol. Water Conserv., Gdansk, Poland). **Unieszkodliwianie sciekow pestycydowych w Polsce w swietle badan i zamierzen. [Detoxication of pesticide-contaminated wastewaters in Poland from the vie-**

wpoint of analysis and planning.] *Przemysl. Chem.* 55(4): 183-185; 1976. (Polish)

Experiments were performed regarding the decontamination of pesticide manufacturing wastewaters in Northern Poland. A number of techniques have been proposed for this purpose in the literature, but none of these adequately eliminates the environmental hazard posed by pesticides. Filtration through a charcoal column removed various percentages of the pesticides present in solutions passed through them. Pesticide levels in waste water from washing equipment containing various pesticides ranged from 0.056 μg/l for malathion, fenitrothion, methyl parathion, and chlorfenvinphos to 50 μg/l for propoxur.

77-0558. O'Shaughnessy, E.; Kraft, G. H. (Dept. Rehab. Med., Univ. Washington Sch. Med., Seattle, WA). **Arsenic poisoning: Long-term follow-up of a nonfatal case.** *Arch. Phys. Med. Rehabil.* 57(8): 403-406; 1976. (8 references)

A rare case of survival from severe arsenic poisoning is reported. This case provides a unique opportunity to gather information on the serial changes in muscle strength, motor nerve conduction velocity, and electromyographic changes in denervated muscles over a three-year period. A 19 yr old woman drank an undetermined amount of sodium arsenate and 30 mg flurazepam in a suicide attempt and was hospitalized 12 hours later. During the first week the patient lapsed into coma and developed acute renal failure, a left bundle branch block and a pleural effusion. Ankle deep tendon reflexes were absent. On the 10th day her mental status started to clear, but deep tendon reflexes could no longer be obtained at the brachioradialis, quadriceps or triceps surae. Renal function was normal by the 11th day, but bone marrow aspiration revealed a suppression of the red blood cell precursors. The muscles of the lower extremities were more markedly affected than the upper extremities. Recovery started in about 6 weeks. At the time of discharge, 3 months later, muscle testing of the upper extremity indicated good strength in the proximal muscles, fair in the forearm, and poor in the intrinsic hand muscles. In the lower extremity, the proximal muscles were considered as good in strength, with poor strength in the plantar flexors and questionable function of the dorsiflexors. Thirty-four months after admission, muscle testing revealed a normal upper extremity, with normal strength in the lower extremity except for the dorsiflexors of the ankle and first toe, in which strength was fair, and the dorsiflexors of the remaining toes, in which strength was absent.

See also **77-0473** **77-0475** **77-0655**

77-0559. Suzuki, T.; Takeda, M. (Natl. Inst. Hyg. Sci., Tokyo, Japan). **Microbial metabolism of *N*-methylcarbamate insecticide. IV. New metabolites of *o-sec*-butylphenyl *N*-methylcarbamate by *Cladosporium cladosporioides*.** *Chem. Pharm. Bull.* 24(9): 1988-1991; 1976. (5 references)

The fungus *C. cladosporioides* metabolized BPMC to phenols with hydroxylated side-chains and to ω-carboxylic acid. It was not possible to determine whether the hydrolysis of carbamoyl groups preceded the hydroxylation of the side-chain, or the reverse. *Cladosporium* isolated from soil was incubated in broth for 11 days, then acidified to pH 2.0 and extracted with ether, followed by further extraction of the ether layer with a saturated sodium bicarbonate solution. Three phenolic metabolites were obtained by column chromatographic fractionation of the remaining ether phase, followed by gas column chromatography.

77-0560. Ubaidullaev, R.; Kamildzhanov, A. Kh. (Uzbek Sci. Res. Inst. Sanit., Hyg., Occup. Dis., Tashkent, USSR). **K toksikologii malykh kontsentratsii fozalona v atmosfernom vozdukhe. [Toxicology of small concentrations of phosalone in the atmosphere.]** *Gig. Sanit.* (7): 10-14; 1976. (6 references) (Russian)

Experiments with humans and rats have led to the determination of a suggested maximum permissible single exposure and maximum daily average concentration value for phosalone of 0.01 mg/m^3. An electroencephalograph was used to determine the effect of phosalone on the nervous system of human volunteers. The threshold of odor detection was also measured. Rats were exposed to chronic inhalation to determine the toxicity of phosalone at temperatures ranging from moderate to high.

77-0561. Gorbachevskaya, E. F. (All-Union Sci. Res. Inst. Pestic. Polym. Plastic, Kiev, USSR). **Immunologicheskoe sostoyanie organizma pri peroral'nom vozdeistvii γ-izomera geksakhlortsiklogeksana. [The immunologic status of the body after peroral administration of hexachlorcyclohexane γ-isomer.]** *Gig. Sanit.* (10): 14-18; 1976. (10 references) (Russian)

A comparative study of immunological tests has demonstrated that the level of fetal reticulocytes and hemoglobin and of autoantibodies against erythrocytes can be used as indices of initial immunologic changes. Each of these parameters was greatly increased over a three-month period when γ-BHC (lindane) was administered intragastrically at 1/50 of the LD50 per day. The greatest increase was seen in the levels of autoantibodies against erythrocytes.

77-0562. Anonymous. **Disulfiram.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 85-95. (50 references)

An increased incidence of liver cell tumors and a slight increase in the number of lung tumors were observed in males of one strain of mouse given 100 mg/kg bw disulfiram daily from 7 days to 4 weeks of age and 323 mg/kg diet thereafter until 78 weeks of age. Pulmonary adenomas were found in 5 of 17 surviving male (C57BL/6xC3H/Anf)F_1 mice (compared to 5/79 in controls; $p < 0.02$), and hepatomas were found in 8 of the 17 (compared to 8/79 in controls; $p < 0.001$). No increased malignancy was noted among male rats given weekly oral doses of 500 mg/kg bw of disulfiram. An increased incidence of reticulum-cell sarcomas appeared among female mice given single subcutaneous injections of 1,000 mg/kg. Toxicity in mice, oral LD50's in rats, rabbits, and dogs (from 2 to 10 g/kg bw), metabolism in rats, the mechanism of disulfiram-ethanol interaction, and the inhibitory effect of disulfiram on benzo(a)pyrene-induced carcinogenesis are briefly reviewed. Disulfiram can react with nitrate under mildly acidic conditions to form *N*-nitrosodiethylamine, which has been shown to be carcinogenic in 10 animal species.

77-0563. Anonymous. **Zineb.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 245-257. (40 references)

The carcinogenicity and other health hazards of zineb and its metabolites were investigated in laboratory animals. An increased incidence of lung adenoma was found in one strain of mice (C57BL) given 3500 mg/kg body weight zineb for 6 weeks; no such increase was found in strain A mice on the same regimen, or for mice fed 464 mg/kg bw from 7 days to 4 weeks of age and 1298 mg/kg diet for 74 weeks thereafter. No significant increase of tumors was found after 22 months among rats given twice weekly oral doses of 285 mg/kg bw zineb, or among rats given 500, 100, 2500, or 10,000 mg/kg of diet for 2 years. There was a small increase in the incidence of systemic reticulum-cell sarcomas among rats given single subcutaneous injections of 1,000 mg/kg bw zineb, and an increase of tumors among rats given a subcutaneous implant of 20 mg/kg bw zineb. Lung adenomas were found in 6 of 20 surviving offspring of strain A mice given single i.p. injections of 8 mg/animal zineb during the second half of pregnancy. Retarded pregnancy, increased sterility, fetal resorption, early postnatal deaths and deformities were observed in rats exposed to 100 mg/kg bw/day; congenital abnormalities were found in 12 to 100% of fetuses after single dose administration of 2 to 8 g/kg bw to pregnant rats. One man suffering hypocatalasemia developed sulfhemoglobinemia, hemolytic anemia and Heinz body formation after contact with zineb. An increase in chromosome abnormalities in peripheral blood lymphocytes was observed in persons occupationally exposed to zineb. The zineb metabolite ETU produced liver-cell tumors after oral administration to 2 strains of mice. Chemical and physical data, and information on production, use, occurrence and analysis of zineb are given.

77-0564. Anonymous. **Monuron.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 167-176. (26 references)

Data suggesting that monuron is carcinogenic are presented. Mice were given 215 mg/kg bw monuron from 7 days to 4 weeks of age, and 517 mg/kg diet (the maximum tolerated for infant and young mice) for about 74 weeks thereafter. Tumor incidences were significantly higher for male mice of the C57BL/6xAKR strain, among which 6 of 16 had lung adenomas, compared to 9 out of 90 among controls. A total of 13 tumors (1 stomach adenocarcinoma, 4 hepatomas, 4 hepatocellular carcinomas, 2 lung tumors, and 32 malignant kidney tumors) were found in 23 random-bred mice given 6 mg/animal week monuron by stomach tube for 13 weeks; 7 tumors (1 intestinal lymphoma, 2 hepatomas, 2 liver-cell carcinomas, 1 lung tumor, and 1 malignant kidney tumor) developed in 25 C57BL mice under the same regimen. Fourteen of 32 rats given 450 mg/kg monuron/day in food for 18 months developed tumors, compared to 0 tumors among 50 control rats. Tissue retention, metabolism, and lethal dose were studied in rats and other mammals. The production, use, occurrence, and analysis of monuron are discussed.

77-0565. Anonymous. **Ziram.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 259-270. (41 references)

Studies on the carcinogenicity and mutagenicity of ziram are reviewed. A six-fold increase in chromosome and chromatid aberrations in metaphases of cultured peripheral lymphocytes was reported for workers handling ziram. Exposure of cultured human peripheral lymphocytes to 0.003 to 0.06 mg/ml ziram resulted in a dose-dependent increase in chromosome and chromatid aberrations. The carcinogenicity of ziram was studied in laboratory animals. An increase of hepatomas and fibrosarcomas occurred among rats given 70 mg/kg body weight ziram twice weekly by stomach tube for 22 months; subcutaneous administration of 15 mg/kg bw resulted in a smaller increase of the same tumors. No increased tumor incidence was found among 2 strains of mice given oral doses of 4.6 mg/kg bw from 7 days to 4 weeks of age followed by 15 mg/kg of diet until 78 weeks of age, or for mice given single subcutaneous injections of 46.4 mg/kg bw on the 28th day of life. An increase of lung adenomas at a confidence level lower than 0.05 was observed among mice given weekly doses of 75 mg/kg bw ziram by stomach tube for 20 weeks. Ziram interacted with ethanol to lower acetaldehyde levels in the blood of rats. Ziram at 50 mg/kg bw given for 15 days reduced the fecundity of female but not male rats.

77-0566. Anonymous. **Zectran.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 237-243. (27 references)

An increase in lung adenomas and a slight increase in hepatomas was observed in mice given 4.64 mg/kg bw zectran (mexacarbate) by stomach tube daily from 7 days to 4 weeks of age, and then 11 mg/kg of diet (maximum tolerated concentration for infant and young mice) until 78 weeks of age. No increase was observed for female mice of the same strain, or for males or females of another strain. No increase of tumor incidence was observed after 78 weeks of life for mice given subcutaneous injections of 10 mg/kg bw zectran on the 28th day of life. The oral and dermal LD50's of zectran in rats are 14 to 63 and 1500 to 2500 mg/kg body weight, respectively. The dog urine metabolites of an oral dose of zectran, and the metabolites from dog and rat liver homogenates, dog kidney homogenates, and rat-liver microsomes are given. Zectran increased reverse mutation in bacteria, and caused a lowering of blood acetylcholine in a case of acute human poisoning. Chemical and physical data, production, use, occurrence, and analysis of zectran are also discussed.

77-0567. Anonymous. **Thiram.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 225-236. (48 references)

Thiram can react with nitrate under mildly acid conditions, similar to those in the human stomach, to produce *N*-nitrosodimethylamine, which has been shown to be carcinogenic in 7 animal species. Humans have shown no adverse effect from exposure to 0.5 g/day of thiram, although there is an interactive effect with ethanol in the blood. Carcinogenicity studies involving oral and subcutaneous administration to mice are inconclusive. Mice were given 10 mg/kg bw thiram from 7 days to 4 weeks of age, and 26 mg/kg diet for 74 weeks thereafter, or injected subcutaneously with 46.4 mg/kg bw on the 28th day of life and observed after 78 weeks of age: no increased tumor incidence was noted. Two lung adenomas were found among 51 mice autopsied 9 months after the last of 5 weekly injections of 300 mg/kg bw thiram. There was a small reduction in growth rate among rats fed 100, 300, or 500 mg/kg of diet, increased mortality in those fed 300 mg/kg, and convulsions, thyroid hyperplasia, and calcification of the cerebellum, hypothalamus, and medulla oblongata among those fed 500 mg/kg. Oral doses of 10 to 30 mg/animal adversely affected pregnancy in rats. Thiram produces chromosome aberrations in barley and in the metaphases of bone-marrow cells of mice given 100 mg/kg bw orally.

77-0568. Anonymous. **Propham.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 189-200. (26 references)

No carcinogenicity was found among mice fed 0.1% or 0.5% propham for 18 months. No increased tumor incidence was found for mice receiving 215 mg/kg bw

propham from 7 days to 4 weeks of age and 560 mg/kg of diet (maximum tolerated dose for infant and young mice) for 74 weeks thereafter. No effect was noted after 2 years among hamsters fed 2 g propham/kg diet for 33 months. There was no increased tumor incidence among mice injected subcutaneously and intramuscularly with propham in concentrations from 215 to 400 mg/kg bw, among rats injected with 400 mg/kg bw monthly for 6 months, among mice given 5 mg/animal intraperitoneally over a period of 4 weeks, or among mice or rats given intrapleural injections of 400 mg/kg at intervals for 6 months. Skin papillomas were induced by oral administration of 15 mg/animal given once, 15 mg given weekly for 10 weeks, and 1 g/kg of diet in combination with skin application of a promoting agent, croton oil. The same dosages with Tween 60 as the promoting agent produced far fewer papillomas.

77-0569. Anonymous. **Maneb.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 137-149. (41 references)

A group of strain A mice was given 6 weekly stomach tube doses of 500 mg/kg bw maneb; 23 of 42 developed lung adenomas after 9 months, compared to 12 of 45 controls. Experiments with 3 other strains, one treated similarly (500 mg/kg bw up to 9 months), two given 46.6 mg/kg bw from 7 days to 4 weeks of age and 158 mg/kg of diet for 74 weeks thereafter (the maximum tolerated dose for infant and young mice), showed no significant increase of tumor incidence. Mice given subcutaneous injections of 100 mg/kg maneb from the 28th day to the 78th week of life exhibited no significant increase of tumors. The metabolite ETU produced thyroid carcinoma in rats and liver cell tumors in mice. No evaluation of maneb's carcinogenicity can be made on the basis of these data. Maneb caused increased embryonic death, resorptions, stillborn young, and unviable neonates in female rats given 50 mg/kg bw during pregnancy, and caused a reversible decline of fertility among male and female rats given the same dose when immature. Single oral doses of 1, 2, or 4 g/kg bw on day 11 or 13 of pregnacy increased fetal abnormalities among rats by 12 to 100%.

77-0570. Anonymous. **Dimethylcarbamoyl chloride.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 77-84. (16 references)

Dimethylcarbamoyl chloride applied to skin, subcutaneously, and intraperitoneally produced local tumors in female ICR/Ha Swiss mice. Fifty mice were given weekly s.c. injections of 5 mg dimethylcarbamoyl chloride for 26 weeks; 36 developed local sarcoma and 3 developed local squamous-cell carcinomas, compared to 1 sarcoma and no carcinomas for 50 controls. Thirty mice were given a single cutaneous application of 2 mg dimethylcarbamoyl chloride followed 2 weeks later by 3 applications/week of 2.5 μg phorbol myristyl acetate for 385 days; 6 developed skin papillomas, the first appearing after 79 days, compared to 3 papillomas among 30 controls, the first appearing after 224 days. Thirty mice were given weekly i.p. injections of 1 mg dimethylcarbamoyl chloride for up to 450 days; 14 developed papillary tumors of the lungs. One case of eye irritation and 1 of liver disturbance, and no case of cancer death have been reported for occupational exposure to dimethylcarbamoyl chloride.

77-0571. Anonymous. **Diallate.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 69-75. (16 references)

Diallate at maximum tolerated oral dosages produced liver tumors in males of 2 strains and females of 1 strain of mouse. Mice were fed 215 mg/kg bw from 7 days to 4 weeks of age, then 560 mg/kg of diet until 78 weeks of age. The incidence of hepatoma in 2 strains of male mice was 13/16 and 10/18, compared with 8/79 and 5/90 for respective controls. The incidence among females for the 2 strains was 3/16 and 1/15, compared to 0/87 and 1/82 for controls. A single subcutaneous injection of 1,000 mg/kg bw produced a slight increase in the incidence of systemic reticulum-cell sarcoma in male mice of one strain, and no sarcoma in males of another strain. Oral LD50 values for diallate in rats and rabbits are given. Diallate injections caused central nervous system excitation progressing to depression and clonic-tonic convulsinos in mice, rats, and cats; application to eyes and skin of guinea-pigs and rabbits caused local irritation, weight loss, neutrophile leucocytosis, eosinopenia, and erythropenia; oral and subcutaneous administration produced similar results.

77-0572. Anonymous. **General remarks on carbamates, thiocarbamates and carbazides.** *IN: IARC Monographs on the Evaulation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 23-34. (56 references)

The experimental literature on carbamates, thiocarbamates, and carbazides that are produced and distributed in socially significant quantities is reviewed. The proven and potential carcinogenic and mutagenic *N*-nitroso derivatives of the reaction of alkylureas, alkylcarbamates, and carbamate and thiocarbamate pesticides with nitrate are listed. Carbaryl, zectran (mexancarbate), diallate, zineb, and ziram cause central nervous system malfunction under conditions of severe poisoning; carbaryl and zectran are known to inhibit acetylcholinesterase activity; carbaryl, semicarbazide hydrochloride, *n*-propyl carbamate, maneb, zineb, ferbam, and thiram are teratogenic in experimental animals; several bisdithiocarbamates cause goiter in laboratory animals, and there is evidence of this effect in men exposed to thiram. Most of the alkyldithiocarbamates and thiuram sulfides induce accumulation of acetaldehyde in the blood.

77-0573. Anonymous. **Carbaryl.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 37-53. (75 references)

Data on carcinogenicity, toxicity, mutagenicity, metabolism, teratogenicity, use, occurrence, analysis, and production of carbaryl are provided. Three fibrosarcomas and 1 osteosarcoma were found among 12 survivors from 60 rats given 30 mg/kg daily oral doses for 22 months, compared to 1 fibrosarcoma among 46 controls. No carcinogenic effect was observed for subcutaneous administration to rats or for one-dose oral administration of 100 mg/kg to mice. Carbaryl reacted with nitrate under acid conditions simulating those found in the human stomach to yield *N*-nitrosocarbaryl, which has been shown to be carcinogenic in rats. Inhalation, skin absorption, and ingestion of carbaryl by workers and volunteers were studied; amounts of urinary excretion, urinary metabolites, and organ-specific metabolic activity were determined; ingestion of 12 mg/kg/day for 6 days produced a decrease in the ratio of amino acid:creatinine nitrogen in the urine of human volunteers.

77-0574. Anonymous. **Chlorpropham.** *IN: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates and Carbazides.* Vol. 12, Lyon, 1976, pp. 55-68. (40 references)

A review of 8 laboratory studies showed that chlorpropham produced no carcinogenic effects when administered orally to mice, rats, and hamsters or subcutaneously to mice. In one experiment with oral administration in mice, chlorpropham initiated skin cancer, but this was not confirmed in a subsequent experiment. The excretion, metabolism, and fetal uptake of chlorpropham were studied in several additional experiments with animals. Chlorpropham inhibited spindle fiber formation and induced chromosome aberrations and chlorophyll mutations in plants.

77-0575. Sahi, B. P.; Rai, M.; Haque, M. M. (Sugarcane Res. Inst., Pusa, Bihar, India). **Effect of some soil applied insecticides on microbial population in calcareous soil of sugarcane belt in north Bihar.** *Indian Sugar* 26(4): 203-204; 1976. (5 references)

Gamma-BHC (lindane) in sandy loam increased the bacteria population and reduced the number of fungi and protozoa under laboratory conditions. Aldrin, heptachlor, BHC, and gamma-BHC at an equivalent concentration of 1 kg active ingredient/hectare were incubated with soil at 30 C; total bacteria, fungi, and protozoa were measured at 24 hours, 15 days, and 30 days. All experimental conditions caused an initial rise, a fall after 15 days, and a recovery of bacterial population after 30 days; only the gamma-BHC sample recovered and significantly exceeded the initial rise, while also showing the most significant long-range depression of fungi and protozoa. This effect may be beneficial for plant nutrition, partially explaining increases noted in the growth and yield of sugarcance that cannot be accounted for by pest control alone.

77-0576. Domir, S. C.; Woolson, E. A.; Kearney, P. C.; Isensee, A. R. (Pestic. Degradation Lab., Agric. Environ. Qual. Lab., Agric. Res. Serv., U. S. Dep. Agric., Beltsville, MD). **Translocation and metabolic fate of monosodium methanearsonic acid in wheat (*Triticum aestivum* L.).** *J. Agric. Food Chem.* 24(6): 1214-1217; 1976. (21 references)

The distribution and metabolic fate of the arsenical herbicide monosodium [^{14}C]methanearsonate (MSMA) in wheat (*Triticum aestivum* L. var. Waldon) was investigated 2, 4, and 13 weeks following foliar applications. Atomic absorption was used to analyze arsenic and liquid scintillation spectrometry was used to analyze ^{14}C residues in roots, leaves, and seeds harvested from wheat. Results suggested primarily symplastic, but some apoplastic movement of [^{14}C]MSMA. A total of only 0.2% of the leaf applied 89 μg of [^{14}C]MSMA was detected in the seeds. ^{14}C (20% of that applied) exuded out of the roots into the soil. Using unlabeled MSMA at 3.36 kg/ha resulted in increased residues in wheat seed grown in greenhouse conditions. Thin-layer and ion-exchange chromatographic analyses of extracts from root, shoot, treated leaves, and seeds indicated that the carbon-arsenic bond remained intact during the 3-month study. (Author abstract by permission)

77-0577. Santi, R.; Gozzo, F. (Montedison S.p.A., Cent. Ric. Antiparassitari, Milano, Italy). **Degradation and metabolism of drepamon in rice and barnyard grass.** *J. Agric. Food. Chem.* 24(6): 1229-1235; 1976. (12 references)

The fate of $C_6H_5{}^{14}CH_2SCON$- (*sec*-$C_4H_9)_2$ ([^{14}C]Drepamon), applied in preemergence to overspreading water, was investigated in a system including soil, water, and rice plants. A product of microbiological oxidation was isolated from both water and plants and identified as $HOOC{}^{14}ch_2SCON$- (*sec*-$C_4H_9)_2$, whose formation was strictly related to the presence of soil. Among the metabolites of [^{14}C]Drepamon two compounds were identified by cochromatography with its chemical oxidation products as $C_6H_5{}^{14}CH_2S(O)CON$- (*sec*-$C_4H_9)_2$ and $C_6H_5{}^{14}CH_2S(O)_2CON$- (*sec*$C_4H_9)_2$. The former showed unspecific herbicidal activity when applied to demineralized water as the only growing medium for both rice and barnyard grass. The selective action of Drepamon appeared to be unrelated to the level of this metabolite in the plant as a whole and is better explained in terms of different absorption and metabolism of the herbicide in the crop with respect to the weed. (Author abstract by permission)

77-0578. Iverson, F. (Bur. Chem. Saf. Foods Dir., Health Prot. Branch, Ottawa, Ontario, Canada). **Induction**

of paraoxon dealkylation by hexachlorobenzene (HCB) and mirex. *J. Agric. Food Chem.* 24(6): 1238-1246; 1976. (14 references)

The induction of paraoxon dealkylation activity was measured in the microsomal fraction from livers of rats fed for 2 weeks on diets containing hexachlorobenzene (HCB) or mirex. Formation of deethylparaoxon was increased significantly at 2 ppm of HCB and 1 ppm of mirex. Other parameters, boty weight gain, liver weight, microsomal protein, P450, and aminopyrine *N*-demethylase, were not significantly affected by these dose levels, but they were increased after feeding 10 and 40 ppm of HCB or 5 ppm or Mirex. (Author abstract by permission)

77-0579. Waldrep, T. W.; Taylor, H. M. (Lilly Res. Labs., Greenfield, IN). **1-methyl-3-phenyl -5- [3-(trifluoromethyl)phenyl] -4(1H)- pyridinone, a new herbicide.** *J. Agric. Food Chem.* 24(6): 1250-1251; 1976. (3 references)

1-Methyl-3-phenyl-5- [3-(trifluoromethyl) phenyl]phenyl]- 4(1H)-pyridinone (EL-171), a new chemical compound, is herbicidally active at low dosages and is safe for use on cotton. EL-171 controls a wide variety of annual grass and broadleaf weeds and is more active preemergence than postemergence. Susceptible plants treated preemergence with EL-171 emerge with chlorotic leaves, become necrotic, and subsequently die. El-171 is a slow-acting, translocated herbicide, and treated plants appear unable to direct the synthesis of chlorophyll. (Author abstract by permission)

77-0580. Varma, M. M.; Serdahely, S. G.; Katz, H. M. (Howard Univ., Washington, DC). **Physiological effects of trace elements and chemicals in water.** *J. Environ. Health* 39(2): 90-100; 1976. (55 references)

Current knowledge on the presence and effects of heavy metals and organic compounds in wastewater and water supplies is reviewed. Cadmium, lead, mercury, arsenic, beryllium, chromium, manganese, fluorides, nitrates, and more than 60 organic compounds, including the pesticides DDT, DDE, aldrin, benzene hexachloride, chlordane, dieldrin, endrin, heptachlor, isodrin, toxaphene, and aramite are discussed in terms of prevalence in fresh water and carcinogenicity, mutagenicity, and teratogenicity in mammals. Of 66 chemicals whose concentrations have been measured in water, only 33 have been examined for carcinogenicity; of these, 15 have been found to be positive in 1 or more animal tests. Of an estimated 430 potential pollutants within the classes examined, 87 have been examined for carcinogenicity, of which 17 are potential carcinogens. Of 32 compounds examined for teratogenicity, 62% were positive.

77-0581. Kamal, M.; Weisgerber, I.; Klein, W.; Korte, F. (Inst. Oekol. Chem. Gesellschaft Strahlenforsch. Umweltforsch., Munich, West Germany). **Contributions to ecological chemistry CXIV. Fate of 2,2′-dichlorobiphenyl-^{14}C in rats upon long-term feeding.** *J. Environ. Sci. Health* B11(4): 271-287; 1976. (16 references)

A plateau level at which excretion equaled daily administered dose was reached after 36 days among male and female rats given 2 mg/kg diet of 2,2′-dichlorobiphenyl-^{14}C daily for 42 days. At the plateau, the residues in most organs were below 0.2 mg/kg. The rapid elimination was due to the quick metabolization of the compound to products with increased water solubility: monomethoxy-, mono-, di-, and trihydroxy-2,2′-dichlorobiphenyls, conjugates, and a dechlorinated derivative.

77-0582. Peterson, R. H. (Dep. Environ. Fish. Mar. Serv., Biol. Stn., St. Andrews, NB). **Temperature selection of juvenile Atlantic salmon (*Salmo salar*) as influenced by various toxic substances.** *J. Fish. Res. Board. Can.* 33(8): 1722-1730; 1976. (26 references)

Previous exposure to sodium pentachlorophenate (NaPCP), Guthion (azinphosethyl), malathion, Dursban (chlorpyrifos), and Dibrom (naled) lowered the preferred temperature for juvenile Atlantic salmon (*Salmo salar*) tested in a horizontal temperature gradient. Lindane, $CuSO_4$, $ZnSO_4$, $CdSO_4$, Sevin, heptachlor, and fenitrothion did not change the preferred temperature significantly. Comparison with ohter published results indicates that those substances that increase the preferred temperature are more toxic (based on relevant changes in 24-h LC50) at low temperatures and vice versa. It is suggested that such shifts in selected temperature may be of potential immediate, short-term, survival value to the fish. (Author abstract by permission)

77-0583. Maki, A. W.; Johnson, H. E. (Dep. Fish. Wildlife, Michigan State Univ., East Lansing, MI). **Evaluation of a toxicant on the metabolism on model stream communities.** *J. Fish. Res. Board Can.* 33(12): 2740-2746; 1976. (16 references)

The effects of a toxicant, the lampricide TFM (3-trifluoromethyl- 4-nitrophenol), on the metabolism of benthic communities were studied in a series of six indoor model streams resembling typical woodland streams. Each artificially illuminated stream consisted of a 4-m pool section and a 4-m riffle section. A specially developed in situ stream respirometer was used for measurements of net primary production and community respiration in pool and riffle communities. Pretreatment levels of gross primary production ranged during summer, fall, and early winter from 10.7 to 79.0 mg $O_2 \cdot m^{-2} \cdot h^{-1}$ and were suppressed by 25-50% during exposure to 9.0 mg/liter TFM. Community respiration ranged from 10.5 to 36.2 mg $O_2 \cdot m^{-2} \cdot h^{-1}$ during the same time period and was increased 3-50% by the 9.0 mg/liter lampricide treatment. Calculated photosynthesis to respiration (P:R) ratios proved to be sensitive indicators of the influence of the toxicant. The stream communities demonstrated a capacity to adjust to the toxicant influence as evidenced by the rapid return of metabolic rates to

pretreatment levels following the exposure period. (Author abstract by permission)

77-0584. Woodward, D. F. (U. S. Fish Wildlife Serv., Fish-Pestic. Res. Lab., Jackson, WY). **Toxicity of the herbicides dinoseb and picloram to cutthroat (*Salmo clarki*) and lake trout (*Salvelinus namaycush*).** *J. Fish Res. Board Can.* 33(8): 1671-1676; 1976. (21 references)

In static tests of the toxicity of two herbicides, dinoseb (2,4-dinitro-6- *sec*-butylphenyl) and picloram (4-amino-3,5,6- trichloropicolinic acid), to cutthroat (*Salmo clarki*) and lake trout (*Salvelinus namaycush*), the 96-h LC50s ranged from 32 to 1400 μg/liter for dinoseb and from 2050 to 8600 μg/liter for picloram. Decreasing pH from 8.5 to 6.5 increased the toxicity of dinoseb by a factor of 43 and decreased that of picloram by a factor of 0.5. Generally, toxicity increased with increasing water temperature. Sensitivity of both species of fish increased with water hardness in tests of dinoseb but was not affected by water hardness in tests of picloram. The toxicity of both chemicals was not changed by aging in water for up to 4 wk or by exposing the fish longer than 96h. Rate of yolk sac absorption and growth of lake trout fry was reduced in flow-through tests at concentrations as low as 0.5 μg/liter dinoseb or 35 μg/liter picloram. Chronic toxicity of both compounds on early life stages of lake trout is more significant than might be anticipated on the basis of only acute tests with fingerlings. (Author abstract by permission)

77-0585. Borck, K.; Braymer, H. D. (Dep. Microbiol., Louisiana State Univ., Baton Rouge, LA). **The genetic analysis of resistance to benomyl in *Neurospora crassa*.** *J. Gen. Microbiol.* 85(Pt. 1): 51-56; 1974.

Mutants of *Neurospora crassa* resistant to the fungicide, methyl -1- (butyl-carbamoyl)-benzimidazole carbamate, were isolated following u.v. irradiation of conidia. Genetic analysis of 15 of the mutant strains revealed that resistance was due to a single allele averaging 2.9 map units right of *ylo-1*, 17.9 units right of *tryp*-2 and 32.1 units left of *chol*-2 in linkage group VI. Tests of heterokaryons containing both resistant and sensitive alleles indicated that resistance is dominant. The mutants did not possess the same degree of tolerance to the fungicide. (Author abstract by permission)

77-0586. Majumdar, S. K.; Kopelman, H. A.; Schnitman, M. J. (Dep. Biol., Lafayette Coll., Easton, PA). **Dieldrin-induced chromosome damage in mouse bone-marrow and WI-38 human lung cells.** *J. Hered.* 67: 303-307; 1976. (22 references)

Dieldrin caused pronounced mitotic inhibition and produced a 2 to 3-fold increase in chromosome abnormalities at concentrations as low as 1 mg/kg in STS mice bone marrow cells, and 1 μg/ml in human WI-38 cells. Mice were given intraperitoneal injections of dieldrin at 1, 30, and 50 mg/kg; the mitotic index varied inversely with dieldrin concentration; the total percentage of cells with a single chromosomal abnormality (breaks, fragments, interchanges, rings) from a sample of 200 cells was 4.5, 9.5, and 11.0 for the 3 dosage levels, respectively, compared to a maximum of about 1.5% for control cells. Cultured human cells were exposed to 1, 10, and 30 μg/ml; mitotic index varied inversely with exposure, and chromosome damage appeared in 6.5, 7.5, and 11.0% of cells, respectively, compared to less than 2% for control cells. Chromosome interchange and rings appeared in the experimental cells, but in none of the control cells.

77-0587. Ulland, B. M.; Page, N. P.; Squire, R. A.; Weisburger, E. K.; Cypher, R. L. (Litton Bionetics, Inc., Kensington, MD). **A carcinogenicity assay of mirex in Charles River CD rats.** *J. Natl. Cancer Inst.* 58(1): 133-140; 1977. (20 references)

A variety of liver lesions appeared in rats given 50 and 100 ppm mirex in the diet for 18 months. The changes covered a spectrum from fatty metamorphosis and megalocytosis of hepatocytes, cystic degeneration and necrosis, and biliary hyperplasia with periportal fibrosis, to circumscribed areas of cellular alteration, neoplastic nodules, and hepatocellular carcinoma. The increase of neoplastic nodules was statistically significant in male rats at the higher dose. There was no significant increase in tumors other than liver tumors. All experimental animals that developed hepatocellular carcinoma also had neoplastic nodules in the liver, although the converse was not true.

77-0588. Tsuda, H.; Hanonouchi, M.; Tatematsu, M.; Hirose, M.; Hirao, K.; Takahashi, M.; Ito, N. (First Dep. Pathol., Nagoya City Univ. Med. Sch., Nagoya, Japan). **Tumorigenic effect of 3-amino-1H-1,2,4-triazole on rat thyroid.** *J. Natl. Cancer Inst.* 57(4): 861-864; 1976. (18 references)

Outbred female Wistar rats were given amitrole at 2500 ppm in the drinking water. The animals employed were either intact or had been subjected to partial thyroidectomy, with or without autoimplantation of resected thyroid tissue. Experimental groups with surgical treatment but without amitrole administration were also employed. Goiters developed in all of the rats that were given amitrole. Invasive growth of the proliferating follicular tissue through the capsule into adjacent fatty tissue and invasion of pericapsular blood vessels was seen in these groups at a significantly increased frequency compared to controls. Invasive lesions were more frequent in the lobectomized thyroid glands of rats. Seven papillary adenomas composed of atypical cells with hyperchromatic nuclei and many mitoses were found in the thyroid glands and grafts in amitrole-treated groups, whereas no invasive growth or adenomas appeared in the groups treated only with surgery. Cholangiofibrosis developed in 5% of the amitrole treated rats.

77-0589. Stavinoha, W. B.; Modak, A. T.; Weintraub, S. T. (Dep. Pharmacol., Univ. Texas Health Sci. Cent., San Antonio, TX). **Rate of accumulation of acetylcholine in discrete regions of the rat brain after dichlorvos treatment.** *J. Neurochem.* 27(6): 1375-1378; 1976. (23 references)

The percentage increase and the time course for accumulation of acetylcholine were measured in various regions of the brain of rats after intravenous injection of 15 mg/kg dichlorvos. The striatum had the highest rate of accumulation of acetylcholine and the cerebellum had the lowest. The turnover times in minutes for the regions studied were: cerebral cortex, 0.9; hippocampus, 1; striatum, 1.4; cerebellum, 1.7; medulla-pons, 2.2; midbrain, 4.5; and thalamus, 5.6. Dichlorvos inhibited 84-96% of the brain cholinesterase within 1 minute after administration. Previous study of acetylcholine turnover in the brain has relied on the use of precursors, such as choline. There has been difficulty in attaining sufficiently high choline isotope activity to measure changes over a short period of time, and difficulty in establishing the size of the choline pool which is available for synthesis of acetylcholine. The use of the accumulation rate of acetylcholine following inhibition of cholinesterase removes some of these problems.

77-0590. Schimmel, S. C.; Patrick, J. M., Jr.; Forester, J. (Environ. Prot. Agency, Environ. Res. Lab., Sabine Island, Gulf Breeze, FL). **Heptachlor: toxicity to and uptake by several estuarine organisms.** *J. Toxicol. Environ. Health* 1(6): 955-965; 1976. (18 references)

The 96-hour LC50 or EC50 of heptachlor was determined for several estuarine animals. The results for American oyster, pink shrimp, grass shrimp, sheepshead minnow, pinfish, and spot were 1.5, 0.11, 1.06, 3.68, 3.77, and 0.86 μg/l, respectively, for technical grade heptachlor. Heptachlor was accumulated and some metabolized to its epoxide by all the animals tested; fish and oysters accumulated heptachlor in tissue concentrations 2,800 to 21,300 times the concentration in the water; shrimp, only 200 to 700 times. Heptachlor is extremely toxic to estuarine animals: 15% of the pink shrimp in an experimental aquarium died when exposed to 0.0046 μg/l, a level which was undetectable in the water and which left no measurable residues in surviving animals.

77-0591. Pegg, D. G.; Hewett, W. R.; McCormack, K. M.; Hook, J. B. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI). **Effect of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin on renal function in the rat.** *J. Toxicol. Environ. Health* 2(1): 55-65; 1976. (26 references)

Rats treated intraperitoneally with 25 and 50 μg/kg 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) displayed a decreased capacity for renal transport of *p*-aminohippuric acid (PAH) and *N*-methylnicotinamide (NMN), and decreased glomerular filtration rate and effective renal plasma flow. Rats given 10 μg/kg showed slightly decreased NMN accumulation; no effect was observed for intragastric doses of 1 and 5 μg/kg. Exposure to TCDD had no effect on accumulation of 2-deoxyglucose, fractional or volume expansion sodium excretion, or the increase in ammoniogenesis and gluconeogenesis that was observed in acidotic states; the effect of TCDD on renal function is therefore considered to be the result of general toxicosis rather than specific functional lesions.

77-0592. Friedman, M. A.; Sanders, V. (Dep. Pharmacol., Med. Coll. Virginia, Health Sci. Div., Virginia Commonw. Univ., Richmond, VA). **Effects of piperonyl butoxide on dimethylnitrosamine metabolism and toxicity in Swiss mice.** *J. Toxicol. Environ. Health* 2(1): 67-75; 1976. (20 references)

Piperonyl butoxide (PB) in doses of 10 and 20 mg/kg inhibited DMN demethylase activity in Swiss mice by 18 and 37%, respectively, 45 minutes after treatment; a maximal effect (55% inhibition) was seen 2 hours after treatment with 640 mg/kg. Where the suppression was as high as 35%, inhibition continued for 24 hours; at 45 hours there was a stimulation of enzymatic activity. There was no change in *K*m of enzyme kinetic activity, but *V*max decreased from 129 to 49 μmol CH_2O/min-g liver. The mutation frequency of DMN (500 mg/kg) was reduced 42% by 640 mg/kg PB, but PB had no effect on the alkylation of nucleic acids or proteins in the liver, kidney, spleen, or lung of mice, and pretreatment with 640 mg/kg PB had no effect on the LD50 of DMN.

77-0593. Schimmel, S. C; Patrick, James, M., Jr.; Forester, J. (Environ. Prot. Agency, Environ. Res. Lab., Sabine Is., Gulf Breeze, FL). **Heptachlor: uptake, depuration, retention, and metabolism by spot, *Leiostomus xanthurus*.** *J. Toxicol. Environ. Health* 2(1): 169-178; 1976. (18 references)

Concentrations of heptachlor, heptachlor epoxide, and *trans*- and *cis*-chlordane were measured in edible tissues of the estuarine fish, spot (*Leiostomus xanthurus*) after exposure in a flowthrough bioassay to 0.27, 0.52, 1.01, 1.99, and 3.87 μg/liter technical grade heptachlor (65% heptachlor, 22% *trans*-chlordane, 2% *cis*-chlordane, 2% nonachlor). The average bioconcentration factors for heptachlor and *trans*-chlordane were 3,600 and 4,600, respectively, for tissue concentrations ranging from 0.23 to 2.9 μg/g and 0.10 to 1.6 μg/g, respectively. Only 10% or less of the maximum concentrations of heptachlor, heptachlor epoxide, and *trans*-chlordane accumulated during the exposure period remained after 28 days in pesticide-free seawater; an average of 35% of the *cis*-chlordane remained. Maximum concentrations of heptachlor were observed on day 3 of exposure; maximum concentrations of the other compounds on day 17. Most of the heptachlor was eliminated or metabolized to its epoxide.

77-0594. Biernat, S.; Giermaziak, H. (Dep. Anat. Pathol. Inst. Biol.-Morphol., Natl. Acad. Med., Warsaw, Poland).

Zmiany patomorfologiczne w sercu szczura po zastosowaniu intrationu w dawkach toksycznych oraz po duzych dawkach PAM. [**Pathomorphological changes in rat heart after administration of intration in toxic doses and after large doses of PAM.**] *Med. Pr.* 27(4): 241-251; 1976. (18 references) (Polish)

Intration (thiometon) and PAM (pralidoxime) induced pathological changes in the heart tissues of experimental rats. Necrosis with calcification of single fibers, focal acidophilic degeneration, edema of the stroma, and glycogen loss in the muscle tissue of the ventricles and auricles were observed 24 hours after administration of toxic dosages of intration. The necrotic foci were sometimes accompanied by inflammation. Edema of the stroma, subendothelial inflammatory infiltrations, and degeneration and desquamation of the endothelium were found in the valves. After 8 days there was a significant decrease in foci of acidophilic degeneration, but coagulation necrosis was evident in remaining foci of the cardiac muscles, and intensified inflammation and focal fibrosis accompanied regeneration of the endothelium in the valves. No necrosis or calcification of fibers was observed 24 hours after administration of PAM, but the cardiac muscle tissue showed extensive foci of acidophilic degeneration, with many inflamed areas in the valves. After 8 days, some coagulation necrosis of cardiac muscle fiber was observed, along with edema of capillary endothelia and ischemia of the cardiac muscle. Intration may have exerted a complex effect through stimulation of the parasympathetic nervous system in addition to direct action upon cells.

77-0595. Giermaziak, H. (Inst. Milit. Med., Natl. Acad. Med., Warsaw, Poland). **Ocena cytotoksycznego dzalania pestycydow fosforotioalifatycznych na modelu zatrucia intrationem.** [**Evaluation of the cytotoxic action of phosphorothioaliphatic pesticides on the basis of intoxication with intration.**] *Med. Pr.* 27(4): 253-257; 1976. (Polish)

Acute intration (thiometon) poisoning of rats and rabbits resulted in an increase of the activity of the lysomal enzymes beta glucuronidase (β-GR), acid phosphatase (AcP), and acid protease (KT-A), a decrease in blood glucose, an increase in leukocytes in peripheral blood, changes in electrocardiograph readings (slower heart beat, greater duration of PQ interval, change in voltage of T wave), and myocardial changes ranging from slight organ congestion to necrosis and hyaline degeneration. Nonlysosomal alkaline protease (AP) was also measured. Atropine sulfate and 2-PAM apparently helped to moderate the severity of these toxic symptoms.

77-0596. Giermaziak, H.; Andrzejewski, S. (Inst. Milit. Med., Natl. Acad. Med., Warsaw, Poland). **Badania porownawcze wplywu ostrego zatrucia intrationem i leczenia na zapis krzywych elektrokardiograficznych u szczurow i krolikow.** [**Comparative studies of the effect of acute intration intoxication and treatment on the record of electrocardiographic curves in rats and rabbits.**] *Med. Pr.* 27(5): 377-383; 1976. (22 references) (Polish)

Changes in the electrocardiograms (EKG) of rats and rabbits exposed to acute toxic doses of intration (thiometon) included a slower heart rate, lengthening of the PQ interval, and deviations in the morphology of the T wave. The T deflections were flattened in rats, and the voltage was increased in rabbits. The administration of 2-PAM inhibited the toxic effects of intration, reactivating cholinesterase and stabilizing lysosomal membranes. Experimental animals exposed to atropine sulfate showed no important changes in EKG.

77-0597. Miyazaki, T. (Sch. Pathol., Tokyo Dent. Coll., Tokyo, Japan). [**Ultramicromorphological study of the liver, especially its whorl-like structure, in rats administered a fungicide, 3-(3,5-dichlorophenyl)- 5,5-dimethyloxazoline-2,4-dione (DZ).**] *Keio Igaku (J. Keio Med. Soc.)* 53(5): 485-507; 1976. (18 references) (Japanese)

The liver parenchymal cells of Sprague-Dawley rats given diets containing 3% of a fungicide, 3-(3,5-dichlorophenyl)- 5,5-dimethyloxazoline- dione (DZ dichlozoline), were examined microscopically, electron microscopically and fluorescence-microscopically. Particular attention was paid to the microstructure of whorl-like corpuscules and the course of their formation with time after administration of DZ. On gross examination, most of the animals were seen to become sluggish in motion, and their liver weight and size increased. Cytoplasmic inclusions of whorl-like corpuscles appeared after administration of DZ for more than 4 weeks. Microscopically the inclusions were composed of concentric multilaminar membranes enclosing lipid droplets and tubular smooth endoplasmic reticulum (s-EPR). The outer membranes of the inclusions were smooth, and they were assumed to be related to the rough endoplasmic endoplasmic membrane (r-EPR). A mode of formation of the inclusions was assumed. The formation and time-change of the whorl-like corpuscular inclusions are probably progressive rather than degenerative. The similar formation of whorl-like inclusions upon administration of carcinogenic substances, protein synthesis inhibitors, and insecticides was compared to the present cases. The origin of the whorl-like inclusions was considered to be the response of the liver cells in detoxifying DZ, resulting in progressive pathological changes.

77-0598. Anonymous. **Getting kepone out of the body.** *Med. World News* 18(1): 32; 1977.

The intestinal reabsorption cycle of Kepone (chlordecone) has been blocked in exposed workers by cholestyramine, an anion resin usually used to treat hyperlipidemia. Kepone that collects in the bile is reabsorbed through the intestine before it can be excreted; a 6 to 7-fold increase in the Kepone found in stool specimens occurred when 9 exposed workers were given 24 gm/day of cholestyramine for 5 days. Cholestyramine had minimal one-dose side effects; no metabolites of Kepone were iden-

tified in tissues, urine, or stools, although there was negligible excretion of Kepone in urine and sweat among treated workers. An untreated group of 15 exposed workers had a daily mean fecal excretion rate of 0.075% of the Kepone body load. High concentrations have been found in the liver, whole blood, subcutaneous fat, and gallbladder fat; biopsies have indicated excess fat, numerous dense bodies, and proliferated smooth endoplasmic reticulum in the liver. It is not known whether cholestyramine will relieve symptoms of Kepone poisoning.

77-0599. Kamataki, T.; Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN). **Metabolism of diethyl *p*-nitrophenol phosphorothionate (parathion) by a reconstituted mixed-function oxidase enzyme system: studies of the covalent binding of the sulfur atom.** *Mol. Pharmacol.* 12(6): 933-944; 1976. (30 references)

During the metabolism of parathion by a reconstituted mixed-function oxidase system from rat liver, the sulfur-containing portion of the molecule becomes covalently bound, predominantly, if not exclusively, to cytochrome P-450. Companion experiments using ^{14}C-labeled parathion indicated that more than 95% of the sulfur bound to cytochrome P-450 is free of the remainder of the parathion molecule. Thus the bound sulfur is the sulfur atom released in the metabolism of parathion to paraoxon. Investigations concerning the nature of the covalent bond between the sulfur atom and cytochrome P-450 suggested that about 50% becomes bound to the side chain of the cysteine in the cytochrome P-450 apoenzyme, forming a hydrodisulfide. Binding of the sulfur to cytochrome P-450 of the reconstituted system apparently leads to crosslinking of the proteins of the reconstituted system to form high molecular weight complexes. Examination of the binding of sulfur to the macromolecules of intact rat liver microsomes on incubation with parathion revealed that the majority of the atomic sulfur is bound to protein(s) precipitated by an antibody to rat liver cytochrome P-450. This binding of sulfur to the macromolecules of intact microsomes also leads to the formation of high molecular weight complexes as determined by sodium dodecyl sulfate-polyacrylamide gel electrophoresis. (Author abstract by permission of Academic Press)

77-0600. Kamataki, T.; Belcher, D. H.; Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN). **Studies of the metabolism of diethyl *p*-nitrophenol phosphorothionate (parathion) and benzphetamine using an apparently homogeneous preparation of rat liver cytochrome P-450: effect of a cytochrome P-450 antibody preparation.** *Mol. Pharmacol.* 12(6): 921-932; 1976. (29 references)

A procedure is described for simultaneous purification of cytochrome P-450 and partial purification of NADPH-cytochrome c reductase from the livers of phenobarbital-treated rats. Using a reconstituted system containing these enzymes, we have examined the metabolism of benzphetamine and parathion. Both dilauroyl phosphatidylcholine and deoxycholate must be present in the reconstituted system for maximal metabolism of these two substrates. Excluding deoxycholate from an otherwise complete reconstituted system decreases the rate of metabolism of benzphetamine by about 80%, and of parathion by approximately 40%. The maximal rates of metabolism of benzphetamine and parathion using this rat liver reconstituted system resemble those observed using reconstituted systems containing cytochrome P-450 and NADPH-cytochrome c reductase similarly prepared from the livers of phenobarbital-treated rabbits. An antibody (or antibodies) to the rat liver cytochrome P-450 has been prepared by injecting this enzyme into rabbits. Using Ouchterlony double-diffusion analysis, this antiserum exhibits good reactivity against rat liver cytochrome P-450 but poor reactivity with apparently homogeneous cytochrome P-450 purified from the livers of phenobarbital-treated rabbits. In contrast, using quantitative immunoprecipitation, some affinity of the rat liver cytochrome P-450 antibody for rabbit liver cytochrome P-450 can be demonstrated. The antibody preparation also inhibits the ability of a rabbit liver reconstituted system to metabolize parathion. However, in all cases, the antibody preparation is much more active against rat liver cytochrome P-450. (Author abstract by permission of Academic Press)

77-0601. Pohlann, R.; Werner, E.; Eschke, R. (Sekt. Tierprod. Veterinaermed. Humboldt-Univ., Berlin, DDR). **Zur Problematik der Anwendung von insektoakariziden Karbamidsaeureestern in der Tierproduktion. 3. Mitt: Chronische Toxizitaet insektoakarizider Karbamidsaeureester. [Use of insecto-acaricidal carbamic acid esters in livestock farming. Part 3. Chronic toxicity of insecto-acaricidal carbamic acid esters.]** *Monatsh. Vet.* 31(6): 217-221; 1976. (19 references) (German)

Long-term oral administration of small, minimally toxic doses of carbamic acid esters to farm animals had an effect, adaptive or depressive according to dosage, on acetylcholinesterase activity. Experiments on sheep, rabbits, and rats also revealed reversible metabolic changes, including changes in SGOT, SGPT, alkaline phosphatase, and blood sugar. Experiments and a review of the literature suggest that carbamic acid esters may also have embryotoxic and teratogenic effects.

77-0602. Pohlann, R.; Werner, E. (Sekt. Tierprod. Veterinaermed. Humboldt-Univ., Berlin, DDR). **Zur Problematik der Anwendung von insektoakariziden Karbamidsaeureestern in der Tierproduktion. 4. Mitt: Rueckstandsdynamik insektoakarizider Karbamidsaeureester unter besonderer Berueecksichtigung des Karbaryls. [Use of insecto-acaricidal carbamic acid esters in livestock farming. Part 4. Dynamics of residues of insecto-**

acaricidal carbamic acid esters with particular reference to carbaryl.] *Monatsh. Vet.* 31(6): 221-226; 1976. (31 references) (German)

The quantities and residence times of some common insecto-acaricidal carbamate esters in organs, tissue, fowl eggs and milk of livestock were determined. The results are discussed with respect to the requirements of the Zero Tolerance Rule that applies to livestock. Carbamic acid esters undergo rapid detoxification and are soon excreted by warm-blooded farm stock; no cumulative effects have been noted, and so the use of carbaryl substances for the treatment of ectoparasites is considered safe, provided that an interval of 14 days is allowed between the last application and slaughter. The literature on the metabolism of carbaryl is also reviewed.

77-0603. Egert, G.; Greim, H. (Abt. Toxikol., Gesellsch. Strahlen- Umweltforsch. mbH, Neuherberg, Germany). **Formation of mutagenic *N*-nitroso compounds from the pesticides prometryne, dodine and carbaryl in the presence of nitrite at pH 1.** *Mutat. Res.* 37(2/3): 179-186; 1976. (46 references)

Environmental chemicals including pesticides carrying secondary and tertiary amino groups are suggested to be a health hazard to man since potentially carcinogenic nitroso compounds may be formed in the presence of nitrite at low pH values resembling conditions in the human stomach. Nitrosation of the isopropylaminotriazine prometryne, the *n*-dodecyl guanidine dodine and the *N*-methylcarbamate carbaryl was investigated in the presence of HCl and acetic acid at pH 1 and excess sodium nitrite for 4 hr at 37°C. The reaction products were extracted with CCl_4 and were analyzed qualitatively and quantitatively by infrared spectroscopy, nuclear-resonance spectrometry, GC/mass spectrometry and by spectrophotometry. All compounds investigated formed *N*-nitroso derivatives in the following yields: carbaryl 67%, dodine 12% and prometryne 14%. The *N*-nitroso derivatives per se were not or only slightly mutagenic to *Escherichia coli* K12 or *Salmonella typhimurium* TA 1538. However, significantly increased mutation frequencies were seen after metabolic activation by mouse-liver microsomes. These results add to the observations that among environmental chemicals not only those containing methyl- or ethyl-substituted amino groups form potentially carcinogenic nitroso derivatives but also those with isopropylamino groups as well as alkyl-substituted guanidine derivatives. (Author abstract by permission)

77-0604. Plewa, M. J.; Gentile, J. M. (Univ. Illinois, Urbana, IL). **Plant activation of herbicides into mutagens - the mutagenicity of field-applied atrazine on maize germ cells.** *Mutat. Res.* 38(6): 390; 1976.

A field bioassay was developed in which the reversion at the *waxy* locus in *Zea mays* pollen grains is scored. Maize inbreds W22 and W23 were grown to anthesis in plots exposed to atrazine at concentrations commonly used in agriculture. Data on the reversion frequency of the *wx*-C allele to *Wx*-C indicated a 10-fold increase over the reversion shown by control plants.

77-0605. Gentile, J. M.; Plewa, M. J. (Yale Univ. Med. Sch., New Haven, CT). **Plant activation of herbicides into mutagens - the mutagenicity of atrazine metabolites in maize kernels.** *Mutat. Res.* 38(6): 390-391; 1976.

Kernels of maize inbreds W22 and W23 harvested from plots sprayed with atrazine were tested for mutagenicity by measuring their ability to induce mitotic gene conversion in *Saccharomyces cerevisiae* strain D4. Extracts of kernels from plants treated with 5 and 20 ppm atrazine increased the rate of mitotic gene conversion about 2.5 and 4 times, respectively, over control values. Extracts from leaf samples of plants treated with 5 and 25 ppm atrazine increased the rate of mitotic gene conversion about 18 and 30 times, respectively, indicating that maize can metabolize atrazine into a mutagen or mutagens preferentially located in the leaf tissue.

77-0606. Warren, G.; Skaar, P. D.; Rogers, S. J. (Montana State Univ., Bozeman, MT). **Genetic activity of dithiocarbamate and thiocarbamoyl disulfide fungicides in *Saccharomyces cerevisiae*, *Salmonella typhmurium*, and *Escherichia coli*.** *Mutat. Res.* 38(6): 391-392; 1976.

A series of dithiocarbamate and thiocarbamoyl disulfide fungicides were compared for genetic activity on three different microbial test systems. The fungicides Polyram and Dithane M-45 (mancozeb) caused more gene conversion than zineb or maneb. Maneb displayed weak mutagenic activity in 5 *Salmonella* test strains, but produced a 5-fold increase of streptomycin resistant mutants in a strain of *E. coli*. Thiram was the most toxic to fungi, but was lethal only to *exr-* mutants of *E. coli*.

77-0607. Seiler, J. P. (Swiss Fed. Res. Stn., Waedenswil, Switzerland). **The mutagenicity of benzimidazole and benzimidazole derivatives. VI. Cytogenic effects of benzimidazole derivatives in the bone marrow of the mouse and the Chinese hamster.** *Mutat. Res.* 40(4): 339-348; 1976. (20 references)

Methyl benzimidazole-2-ylcarbamate (MBC) administered orally (but not intraperitoneally) produced micro-nuclei in mouse bone marrow at a threshold concentration in the order of less than 10 μg MBC/ml blood. This effect was apparently due to the inhibition of spindle formation or spindle function and required the presence of the carbamoyl group as a necessary but not a sufficient condition. Benomyl and 2-benzimidazoly urea also produced some increased incidence of micronuclei, but three other benzimidazole compounds did not. Continuous concentrations of 8 μ/g MBC/ml blood serum did not provoke the formation of micronuclei, whereas a short-time rise to 12 μg/ml did. The mouse data suggest that this threshold may be applicable to humans, and that existing non-

occupational exposure to MBC does not pose a genetic hazard to the general population.

77-0608. Anderson, D.; McGregor, D. B.; Purchase, I. F. H. (Imp. Chem. Ind. Ltd., Cent. Toxicol. Lab., Alderley Park, North Macclesfield, England). **Dominant lethal studies with paraquat and diquat in male CD-1 mice.** *Mutat. Res.* 40(4): 349-358; 1976. (11 references)

No evidence of mutagenicity was detected at any stage of spermatogenesis among male CD-1 mice given oral doses of up to 4 mg paraquat/kg body weight or 10 mg diquat/kg b.w. daily for 5 days. No pre- or post-implantation losses were observed among female mice impregnated by treated males, and there was no antifertility effect among treated males. This lack of a dominant lethal effect was not due to lack of sensitivity among the animals used, since there was a marked mutagenic response to cyclophosphamide and ethyl methanesulfonate.

77-0609. Kappas, A.; Green, M. H. L.; Bridges, B. A.; Rogers, A. M.; Muriel, W. J. (MRC Cell Mutat. Unit, Univ. Sussex, Brighton, England). **Benomyl- a novel type of base analogue mutagen?** *Mutat. Res.* 40(4): 379-382; 1976. (16 references)

Significant mutagenesis due to benomyl was observed in strains of *Escherichia coli* and *Salmonella typhimurium* using a simplified fluctuation test. No mutagenesis was observed in an excision-proficient strain of *E. coli* (WP2), indicating that a DNA lesion that is detectable and excisable by UV endonuclease is involved in the mutagenic action of benomyl. Similarly, a negative result in CM611, a misrepair and excision-deficient strain of *E. coli*, indicates that the *lex*A+-dependent misrepair pathway is necessary for benomyl mutagenesis. Benomyl may be a new type of base analogue mutagen that, when incorporated into DNA, is detected by UV endonuclease and provokes mutations not by misincorporation during normal DNA replication, but by misrepair of gaps in newly-synthesized DNA. In addition, the mutagenic action of benomyl showed no dose-response change (remaining constant from 0.125 to 1 μg/ml benomyl), an action not characteristic of alkylating agents, but explicable in benomyl in light of its requirement for incorporation into DNA. The action of benomyl may be understood as that of a mutagen needing to be incorporated into DNA, but once incorporated, seen by the cell as a non-pairing purine with a large alkyl or aryl group attached.

77-0610. Mollet, P. (Swiss Fed. Inst. Technol., Dep. Zool., Zurich, Switzerland). **Lack of proof of induction of somatic recombination and mutation in *Drosophila* by methyl-2- benzimidazole carbamate, dimethyl sulfoxide and acetic acid.** *Mutat. Res.* 40(4): 383-388; 1976.

The mutagenic activity of MBC (a benzimidazole derivative) and of 2 solvents was tested in *Drosophila larvae*, using a method that allows for simultaneous detection of mitotic recombination and mutation in somatic cells. Larvae treated with MBC at concentrations between 0.52 and 26.0 mMol/1,000 ml suspension displayed no significant somatic recombination or mutation and no sex-linked recessive lethals. Results were also negative for DMSO and acetic acid, although a weak effect by the latter cannot be ruled out.

77-0611. Zimmermann, F. K. (Tech. Hochsch. Darmstadt, Darmstadt, Germany). **Panel discussion on submammalian systems.** *Mutat. Res.* 41(1): 163-170; 1976. (41 references)

The use of submammalian test systems in screening programs for environmental mutagens is reviewed. All known genetic alterations can be scored, and the genetic nature of the effects established, with test systems that include fruit flies, plants, yeast, bacteria, and other microbes. Pesticides, herbicides (such as atrazine), and fertilizers that may be metabolized into mutagens by agricultural crops can be identified by such systems. The metabolic activation of promutagens by mammals, including humans, can also be combined in several ways with submammalian systems. Reverse mutation systems and selective forward mutation systems for the detection of point mutations are discussed.

77-0612. Engst, R.; Macholz, R. M.; Kujawa, M. (Zentralinst. Ernaehr., Bergholz-Rehbrucke, DDR). **Ein auf experimentellen Befunden basierendes Abbauschema fur Lindan. [A decomposition scheme for lindane based on experimental findings.]** *Nahrung* 20(1): 83-84; 1976. (10 references) (German)

A degradation scheme was developed for lindane based on studies performed on mold cultures, rats, and humans, and taking the available literature into consideration. In contrast to the degradation routes previously suggested this contains only one hypothetical degradation stage. According to the proposed scheme lindane is first decomposed to γ-pentachlorocyclohexane, then to tetrachlorocyclohexanol and pentachlorocyclohexenol, as well as a hypothetical dechlorination intermediate which undergoes further dechlorination, with or without hydroxylation. The phenols formed are excreted in urine and feces of experimental animals in the form of free phenols, sulfates, or glucuronides.

77-0613. Kujawa, M.; Haertig, M.; Macholz, R. M.; Engst, R. (Zentralinst. Ernaehr. Akad. Wiss. GDR, Bergholz-Rehbruecke, DDR). **Der Abbau von 14-C-Lindan durch eine Schimmelpilzkultur. [The degradation of 14C-lindane by a mold culture.]** *Nahrung* 20(2): 181-188; 1976. (3 references) (German)

The metabolism of ^{14}C-lindane was studied in culture medium. Metabolites were measured after 6, 17, 30 and 52 days. The main metabolite was gamma-2,3,4,5,6

pentachlorocyclohexane (gamma-PCCH); it proved short-lived. Penta- and hexachlorobenzene were also measured.

77-0614. Seidler, H. Haertig, M.; Engst, R. (Zentralinst. Ernaehr., Bergholz-Rehbruecke, DDR). **Zum in-vitro-Verhalten von 14-C-markiertem Lindan im Blut. [In vitro behavior of carbon-14-labeled lindane in the blood.]** *Nahrung* 20(2): 213-218; 1976. (6 references) (German)

Simple hexane extraction of blood removes almost 55% of lindane added to blood in vitro and incubated for 10-60 min. Separate extraction of the centrifugally separated blood fractions (plasma, hemolysate, and erythrocyte membranes) increases the recovery rate to a total of 95%. Lindane distribution between plasma and erythrocytes is approximately 1:1. When erythrocytes containing BHC are incubated in fresh plasma almost 60% of the erythrocyte BHC transfers into the plasma. Erythrocytes up almost 90% of the BHC present in an aqueous medium. The hemolysis take findings indicate that BHC is probably transferred through the membrane. The partition of BHC between the cytoplasm and the membrane fraction ranges from 3:7 to 7:3. Cadmium increases and lead decreases BHC binding to erythrocytes; mercury and ethanol have only slight effect.

77-0615. Seidler, H.; Haertig, M.; Engst, R. (Zentralinst. Ernaehr., Bergholz-Rehbrucke, DDR). **Zur Wirkung von DDT und Lindan auf die Schilddruesenfunktion der Ratte. [On the effects of DDT and lindane on the thyroid function in the rat.]** *Nahrung* 20(4): 399-406; 1976. (10 references) (German)

The effects of DDT and lindane on iodine and hormone metabolism were observed in rats. There was a marked increase in the thyroid mass and the thyroid triiodothyronine and thyroxin levels, and a simultaneous decrease of the thyroid iodine level, a reduction of serum iodine and protein-bound iodine, a slight increase in serum thyroxin, and a marked increase of serum triiodothyronine and the iodine fraction in the liver among rats given daily DDT doses of 30 and 75 mg/kg bw. The only striking changes following administration of 12 and 36 mg/kg bw lindane were a decrease of thyroid triiodothyronine and a simultaneous increase of thyroid thyroxin.

77-0616. Konrad, H.; Gabrio, T. (Inst. Milchforsch. DDR, Oranienburg, DDR). **Ueber den Einfluss von Pflanzenschutz- und Schaedlingsbekaempfungsmitteln (PSM) auf die Verarbeitungsfaehigkeit der Milch unter besonderer Beruecksichtigung mikrobiologischer Methoden. [Effects of pesticides and insecticides on the processibility of milk, with special regard to microbiological techniques.]** *Nahrung* 20(7): 715-724; 1976. (22 references) (German)

The effects of pesticides and insecticides on the processing of milk and milk-derived products were studied. The herbicides DNOC, MCPA, MCPB, 2,4-dichlorophenoxyacetic acid, and dalapon, the chlorinated insecticide heptachlor epoxide, and the fungicide pentachlorophenol inhibited the acid-formation of yogurt, kefir, butter, and cheese cultures, the curdling of milk, and the ripening of Camembert cheese at concentrations above 100 ppm. A total of 43 insecticides and other pesticides were tested; most had no effect on the milk products at concentrations below 100 ppm.

77-0617. Solt, D.; Farber, E. (Dep. Pathol., Univ. Toronto, Toronto, Ontario M5G 1L5, Canada). **New principle for the analysis of chemical carcinogenesis.** *Nature* 263(5579): 701-703; 1976. (19 references)

An assay system using rats was developed to quantitatively identify the populations of initiated cells that make up precancerous neoplastic lesions. The assay also makes possible a sequential analysis of some of the early preneoplastic and premalignant hepatocytes for liver cancer. The principle depends on the observation that selective growth of focal precancerous liver cells seems to result from their relative resistance to the cytotoxic action of hepatocarcinogens, coupled with the creation of a local environment for their proliferation. The system consists of an initiator, diethylnitrosamine (DEN); a selective growth inhibitor requiring metabolic activation, 2-acetylaminofluorene (2-AAF); and a growth stimulus, partial hepatecomy. Hyperplastic nodules are known to acquire resistance to the cell toxicity of hepatocarcinogens, and metabolic changes result in decreased uptake and/or metabolic activation of some carcinogens; the assay identifies very early changes in liver cells that proliferate rapidly due to similar resistance to hepatotoxins.

77-0618. Shirasu, Y. (Inst. Environ. Toxicol., Kodiara, Tokyo, Japan). **[Instances of detection of environmental mutagens and their countermeasures.]** *Kogai To Taisaku (Environ. Pollut. Countermeasures)* 12(4): 408-412; 1976. (9 references) (Japanese)

A mutagenesis screening program was carried out, using bacteria as test organisms, on 166 pesticides including 37 fungicides, 46 insecticides, and 63 herbicides. According to the rec-assay method of Gada, 23 pesticides were positive including 9 pesticides positive in the reverse mutation test using *Salmonella typhimurium* TA 1535, 1536, 1537 and 1538 and E. coli B/r, WP 2 hcr plus and hcr minus. Captafol, captan, dexon, dichlorvos, folpet, *N*-(2-hydroxyethyl) hydrazine, 2,4-dinitrophenyl thiocyanate, 5-nitro-1-naphthonitrile, were positive in *S. typhimurium* while only captafol was positive in *E. coli*. Captafol, captan, and folpet were found to be base-change type mutagens with similar phthalimide structures. Dichlorvos, *N*-(2-hydroxyethyl) hydrazine, and vamidothion were also base-change type mutagens, while dexon, 2,4-dinitrophenyl isocyanate, and 5-nitro-1- naphthonitrile were frameshift type mutagens. In the presence of metabolic enzyme the mutagenicity of captan, captafol, folpet and the thiocyanate disappeared, and that of

dichlorvos in TA1513 was also nonexistent. Mutagenicity of 5-nitro-1- naphthonitrile was enhanced. These positively mutagenic pesticides should be screened further by cellular genetic tests on higher species and by the dominant lethal test. Their carcinogenicity should be confirmed in chronic toxicity tests. In view of their persistence as residues in crops they might be banned.

77-0619. Imai, H. (Dep. Ophthalmol., Sch. Med., Kitasato Univ., Sagamihara-shi). [**Toxicity of an organophosphorus pesticide (fenthion) on the retina. Electroretinographic and biochemical study. Correlative study especially on its residue actions on the retina, liver and blood cholinesterase activities and on electroretinogram.**] *Nippon Ganka Gakkai Zasshi (Acta Soc. Ophthalmol. Jpn.)* 79(8): 1067-1076; 1975. (14 references) (Japanese)

Long-lasting changes in the electroretinogram (ERG) and cholinesterase (ChE) activity occurred among rats given single intramuscular injections of 5, 25, and 50 mg/kg bw of fenthion. At 5 mg/kg, an increase in the amplitude of a- and b-waves was noted from the 1st to the 10th day after injection, declining thereafter and returning to control levels after 60 days. The peak times of a- and b-waves decreased until the 8th day, returning to normal after 40 days. At 25 mg/kg, the amplitude of the waves increased on the 4th day after injection, returning to normal after 60 days, and the peak times increased and had not returned to control levels after 60 days. At 50 mg/kg, the amplitude of the waves decreased and had not returned to normal after 60 days; the latency time of the waves decreased after 20 days. The activity of pseudo-ChE in the liver fell to 50% of normal 4 days after injection with fenthion, returning to normal on the 8th day, then becoming overactive from the 22nd to the 30th day; pseudo-ChE in the plasma fell to 15% on the 4th day, reaching normal levels after 14 days; true ChE in the retina fell to only 7.5% of normal on the 4th day, returned to 45% on the 8th day, and was normal again on the 49th day. The good correlation of ERG changes with changes in the inhibition period of ChE indicate that the effects of fenthion persist for as much as 50 days in the retina.

77-0620. Tokoro, T.; Suzuki, K.; Hayashi, K.; Otsuka, J. (Dep. Ophthalmol., Tokyo Med. Dent. Univ. Sch. Med., Tokyo, Japan). [**Development of myopia induced by organic phosphorus pesticide (sumithion) in beagle dogs.**] *Nippon Ganka Gakkai Zasshi (Acta. Soc. Ophthalmol. Jpn.)* 80(1): 51-53; 1976. (40 references) (Japanese)

Myopia developed in the eyes of dogs given oral doses of 5, 1, and 0.5 mg/kg bw of sumithion (fenitrothion) twice weekly for 1 year. Treatment began in June 1973; refraction was measured using Hartinger's refractometer; anterior chamber depth, lens thickness, and axial length were determined using an ultrasonic technique; and intraocular pressure was found using a Mackay-Marg tonometer. Measurements were made before beginning the experimental regimen, and were repeated in October 1973 and March and October 1974 before termination of the experiment in May 1974. Myopia was first identified in October 1974, at which time intraocular pressure had fallen below an elevated level noted in October 1973. No change in the corneal power and no notable change of the refractive components was observed. These results for sumithion are similar to findings for ethylthiometon, suggesting the need for caution in using these low-toxicity organic phosphorus pesticides.

77-0621. Takeda, Y.; Tsukahara, I.; Takaori, S. (Dep. Ophthalmol. Kansai Med. Univ., Japan). [**Effects of chlorfenvinphos, an organophosphate, on ERG and afferent transmission in the central visual pathway.**] *Nippon Ganka Gakkai (Acta Soc. Ophthalmol.)* 79(10): 1345-1352; 1975. (39 references) (Japanese)

The intraperitoneal injection of 4 mg/kg of chlorfenvinphos increased the electroretinogram (ERG) amplitude, reduced the photo-responsiveness of the optic tract (OT) and lateral geniculate nucleus (LG), and caused a slight increase in the photo-responsiveness of the visual cortex (VC) among gallamine-immobilized cats. The same dosage also caused a 78 to 85% decrease of cholinesterase (ChE) activity in the retina, OT, and LG. Exposure to atropine and PAM retarded the effect of chlorfenvinphos on ERG, OT, and LG. These effects of chlorfenvinphos, which are similar to those observed for eserine, are believed to be caused by an accumulation of acetylcholine in the cholinergic projection to the retina and central nervous system.

77-0622. Suzuki, H.; Miyamoto, J. (Research Dep., Pestic. Div., Sumitomo Chem. Ind. Co. Ltd., Takarazuka, Hyogo, Japan). [**Studies on the mutagenicity of fenitrothion, cremart, and denmert.**] *J. Pestic. Sci.* 1(4): 253-259;1976. (19 references) (Japanese)

The genetic toxicity of an insecticide (fenitrothion), of a herbicide (Cremart, *O*-ethyl *O*-(3-methyl 6-nitrophenyl) *N-sec*-butyl phosphorothioamide), and of a fungicide Denmert, *S-n*-butyl *S-p-tert*- butylbenzyl *N*-3-pyridyldithio carbonimidate) was examined by 2 methods using *Bacillus subtilis, Escherichia coli* (W3102) and *Salmonella typhimurium* (TA 1535, 1537 and 1538). The first method comparised determination of the mutagenesis rate from the nutrient requiring type to the non-nutrient requiring type. The second method was detection of the gene-damaging property by comparing the growth inhibition between DNA-repair-deficient strains and wild types, by determination of the change in mutant number of in vitro drug metabolizing systems with homogenates of several organs of rat and mouse, and by determining the change in mutation frequency in a host mediated assay using mice as the host. No mutagenicity and gene-damaging property were found for fenitrothion, Cremart, and Denmert within the range of 10 mg/disc or 1 mg/ml. In in vitro metabolic system the three compounds showed no mutagenicity at the maximum concentration of 1 mg/ml. Even in the host

mediated assay using animals given the compounds p.o. and i.m. at 1/2 LD50 no mutagenicity was detected. Nitrosoguanidine, 2-aminoanthracene, and dimethylnitrosamine, used as positive controls, showed mutagenicity and gene-damaging property at far lower concentrations than those of these 3 compounds.

77-0623. Fujii, Y.; Kurokawa, T.; Ishida, M.; Yamaguchi, I.; Misato, T. (Ageo Research Laboratory, Agrochemicals Div., Nippon Kayaku Co., Ltd., Ageo, Saitama, Japan). **Metabolism of 3,3-dimethyl 4-methoxy benzophenone (NK-049) in the rat.** *J. Pestic. Sci.* 1(4): 313-320; 1976. (10 references)

The experimental rice paddy herbicide NK-049, labeled with carbon-14 at the carbonyl carbon, was administered orally to female Wistar rats at 500 mg/kg. The radiocarbon was rapidly absorbed and distributed into tissue. Tissue radiocarbon was rapidly excreted into urine and feces: 59.38% had been excreted in the feces and 36.15% in the urine within 24 hr after administration. Thus no accumulation in the animal body appears to occur. Intact NK-049 accounted for 75% of the radiocarbon present (46% of the amount administered) in feces. Major urinary metabolites were feed and conjugated 3,3'-dimethyl- 4-hydroxybenzophenone (9%) and 3'-carboxy- 4-hydroxy- 3-methyl benzophenone (28%), and free 3'-carboxy- 3-hydroxymethyl- 4-methoxy benzophenone (23%) and 3-carboxy- 4-hydroxy- 3'-hydroxymethyl benzophenone (9%). Additional oxidized metabolites of NK-049 were identified in the urine.

77-0624. Okawa, H. (Res. Dep., Pestic. Div., Sumitomo Chem. Ind. Co., Ltd. Takarazuka, Hyogo, Japan). [**Synthesis and biological activity of optical isomers of organophosphorus esters.**] *J. Pestic. Sci.* 1(4): 325-334; 1976. (42 references) (Japanese)

Several methods of synthesizing and resolving optically active isomers of organophosphorus pesticides due to asymmetric phosphorus atoms as well as those due to asymmetric carbon atoms in the molecule were described. Many articles concerning their optical purity and absolute structure were also reviewed. The inhibitory power on cholinesterase activity (reactivity toward cholinesterase) of optically active isomers was cited using O-ethyl *S*-2-(ethylthio)ethyl ethylphosphonothiolate. The existence of stereospecificity for the optical isomer was demonstrated in relation to mammalian toxicity, e.g. for *O*-methyl 5-methyl *o*-4nitrophenyl phosphorothiolate. The reason for this stereospecificity was explained.

77-0625. Takimoto, Y.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Ind. Co., Ltd. Takarazuka, Hyogo, Japan). [**Studies on accumulation and metabolism of fenitrothion (sumithion) in fish.**] *J. Pestic. Sci.* 1(4): 261-271; 1976. (31 references)

The accumulation and metabolism of sumithion (fenitrothion) in rainbow trout and southern top-mouthed minnows was studied under laboratory conditions in running water. Bioaccumulation ratios of 200 to 250 were found after 1 to 3-day exposures to 0.1 or 0.2 ppm sumithion, with no increase after longer exposure. The tissue concentrations rapidly declined when the fish were placed in pesticide-free water. Experiments with radioactive sumithion indicate that sumithion is metabolized by rainbow trout to sumioxon, demethylsumithion, desmethylsumioxon, and 3-methyl-4-nitrophenol and its glucuronide, all of which are excreted.

77-0626. Watanabe, H.; Ishibashi, S.; Fukami, J. (Lab. Insect Toxicol., Inst. Phys. Chem. Res., Wako, Saitama, Japan). [**Chlordimeform and its metabolites: toxicity and inhibition of acethylcholine-induced contraction of frog muscle.**] *J. Pestic. Sci.* 1(4): 301-305; 1976. (12 references)

Frog (*Rana nigromaculata*) mortality was 80% after intraperitoneal injection of 300 mg/kg chlordimeform hydrochloride (CD). The metabolites *N*-formyl- 4-chloro-*o*-toluidine (NF) and 4-chloro- *o*-toluidine (CT) were less toxic. Concentrations of 0.1 to 1*M* of CD, NF, CT, and the metabolite *N'*-(4-chloro-*o*-tolyl)-*N*-methylformamidine (DM) produced contractions of frog abdominal muscles. Both CD and DM at 1 m*M* inhibited the effect of acetylcholine on frog muscle tissue (NF and CT did not), and there was a correlation between the degree of inhibition and the toxicity of the compounds. A monoamine oxidase-specific (MAO) inhibitor, iproniazid phosphate (IP), which causes contraction of frog muscles, did not affect the acetylcholine-induced contraction of frog muscles, thus leaving in doubt the relevance of MAO inhibition to the action of CD.

77-0627. Tsutsumi, S.; Ozawa, R.; Imoto, K. (Dep. Pharmacol., Tokyo Dent. Coll., Tokyo, Japan). **Inhibition of cholinesterase activity induced by pyridafenthion.** *Nippon Yakurigaku Zasshi (Folia Pharmacol. Jpn.)* (72): 609-618; 1976. (24 references) (Japanese)

The inhibition of cholinesterase (ChE) activity in the blood of rabbits by pyridafenthion (PD) was reversed by injections of 2-pyridine aldoxime methiodide (PAM). Within 24 hours after oral administration of 500 mg/kg PD, ChE activity in erythrocytes and plasma decreased to 20.5% and 21.5% of normal, respectively. These values rose to 55.5% and 41.4% and 59.1% of normal after a third injection. Studies over a 14-day period confirmed PAM to be a promising antidote for PD poisoning.

77-0628. Szczurek, Z.; Szaflarska-Stojko, E.; Grzybek, H. (Inst. Patol., Silesian Acad. Med., Katowice, Poland). **Zmiany ultrastrukturalne w komorkach watroby szczura w przewleklym zatruciu insektycydami.** [**Ultrastructural changes in liver cells in rats chronically poisoned with insecticides.**] *Patol. Pol.* 27(3): 243-250; 1976. (24 references) (Polish)

Swelling of mitochondria, hyperplasia of the smooth endoplasmic reticulum, reduction of glycogen aggregates, and the appearance of secondary lysosomes were observed in the hepatocytes of rats exposed to 2,000 ppm lindane, 10,000 ppm carbaryl, 1,000 or 5,000 ppm gammacarbatox, or 1,960 ppm IPO 62 in the diet. These ultrastructural changes in the liver were probably due to hypoxia secondary to the disturbance of blood circulation. The toxicity of IPO-62 exceeded that of lindane, which was more toxic than carbaryl.

77-0629. Kuczynski, M. A. (Dep. Histol. Embryol., Inst. Biostruct., Akad. Med., Bialystok, Poland). **Zmiany morfologiczne i histochemiczne w watrobie szczura w podostrym zatruciu foschlorem. [Morphologic and histochemical changes in the liver of rats in subacute poisoning with foschlor.]** *Patol. Pol.* 28(3): 231-241; 1976. (36 references) (Polish)

Dose-related, reversible lesions were found in the liver cells of rats given 0.5 LD50 (250 mg/kg) and 0.1 LD50 (50 mg/kg) of foschlor (trichlorfon) orally over 21 days. The rats were sacrificed 1 and 9 days after the end of treatment, and liver sections were histochemically examined for succinate dehydrogenase, acid phosphatase, and nonspecific esterases.

77-0630. Morton, T. C.; Holan, G.; Virgona, C. T. F. (Div. Appl. Org. Chem., Commonw. Sci. Ind. Res. Organ., Melbourne, Australia). **Metabolism of 1,1-*bis*-(*p*-ethoxyphenyl)- 2-nitropropane in the house fly and the cluster caterpillar.** *Pestic. Biochem. Physiol.* 6(3): 209-214; 1976. (11 references)

Methanol extraction of the bodies of house flies administered 1 mg/ml ENP by topical application to the thorax showed that the compound was deethylated after 24-hour exposure. The isolated metabolites were 1-(*p*-ethoxyphenyl)- 1-(*p*-hydroxyphenyl)- 2-nitropropane and 1,1-*bis*-(*p*-hydroxyphenyl)- 2-nitropropane. Conjugates of these compounds were probably also present. Most of the ENP ingested by caterpillars was excreted unchanged, although a small amount was converted to a polar compound that was probably 1,1-*bis*-(*p*-hydroxyphenyl)-2-propanone. It is of some interest that no metabolites in which the nitropropane portion was modified were detected in the house fly; other experimenters using house flies have found degradation of the nitropropane group of the insecticide Prolan, which is related to ENP.

77-0631. Woolson, E. A.; Isensee, A. R.; Kearney, P. C. (Dep. Agric., Agric. Res. Serv., Beltsville, MD). **Distribution and isolation of radioactivity from ^{74}As-arsenate and ^{14}C-methanearsonate acid in an aquatic model ecosystem.** *Pestic. Biochem. Physiol.* 6(3): 261-269; 1976. (19 references)

The bioaccumulation ratio (BR: concentration in organism/concentration in water) and distribution of ^{74}As-arsenate and ^{14}C-methanearsonate were determined for a variety of aquatic organisms exposed to 10, 100, and 1,000 ppb As in a model aquatic ecosystem. The BR of ^{74}As for crayfish was 80 to 480; for catfish (*Ictalurus punctatus*), 4 to 7; for daphnids, 5; for *Gambusia affinis*, 127; for algae 34; and for crayfish, 5. Homogenates of the organisms were extracted to determine the distribution and form of the 2 arsenicals. The percentage of ^{14}C from monosodium methanearsonic acid (MSMA) in the lipid fraction was larger than that of arsenate in all species (excepting *Gambusia*), apparently because the methyl portion of MSMA is sufficiently lipophilic to cause greater incorporation. Arsenate and MSMA assimilation patterns also differed with respect to the residual protein fraction, which contained a larger percentage of ^{14}C than ^{74}As. The metabolic significance of these findings is discussed.

77-0632. Goodchild, B.; Nicholls, D. M. (Dep. Chem., York Univ., Toronto, Canada). **Decreased inhibitory activity of salt wash preparations toward aminoacyl-tRNA binding to liver ribosomes *in vitro* after administration of DDT.** *Pestic. Biochem. Physiol.* 6(6): 501-516; 1976.

A 0.5 *M* salt wash fraction of ribosomes prepared from the microsome fraction of a liver homogenate of DDT-treated rats differed from that of control animals in lacking the ability to inhibit peptide synthesis. Salt washes from aminonucleoside nephrotic rats exhibited no change in inhibitory activity, and the inhibition in washes from partially hepatectomized rats differed from that of DDT-treated rats with respect to the activity of the ribosome preparations prior to washing. These results emphasize the necessity for a salt-wash step in the preparation of ribosomes for measurement of their activity after the induction of microsomal enzymes. The inhibitor exerted its effect on ribosomes by reducing the elongation factor 1-stimulated step (i.e., aminoacyl-tRNA binding). The effect was removed by heat treatment, trypsin digestion, and Pronase digestion. The inhibitor was different from the thiol and GTP-sensitive inhibitor of liver microsomal membranes and the hemin-reversible inhibitor of reticulocyte lysates, and similar to the ribosomal inhibitor noted in some nonmammalian cells.

77-0633. Chambers, J. E. (Dep. Zool., Mississippi State Univ., Mississippi State, MS). **The relationship of esterases to organophosphorus insecticide tolerance in mosquitofish.** *Pestic. Biochem. Physiol.* 6(6): 517-522; 1976. (11 references)

Mosquitofish (*Gambusia affinis*) that proved highly resistant to organochlorine insecticides were found to have higher levels of both peripheral acetylcholinesterase and carboxylesterases than a second, less-resistant population. The organochlorine resistant fish also had a low tolerance for parathion and methyl parathion. Their esterases demonstrated differing sensitivity to organophosphorus compounds: they were more sensitive to paraoxon inhibition than to methyl paraoxon inhibition,

and the carboxylesterases were far more sensitive to organophosphate inhibition than was acetylcholinesterase.

77-0634. Quistad, G. B.; Schooley, D. A.; Staiger, L. E.; Bergot, B. J.; Sleight, B. H.; Macek, K. J. (Zoecon Corp. Res. Lab., Palo Alto, CA). **Environmental degradation of the insect growth regulator methoprene. IX. Metabolism by bluegill fish.** *Pestic. Biochem. Physiol.* 6(6): 523-529; 1976. (21 references)

Bluegills were exposed to 0.005 ppm and 0.31 ppm of ^{14}C-labeled methoprene in a dynamic flow-through system, and to 0.01 ppm in a model ecosystem. The fish continuously exposed in the flow-through system acquired moderate residues of largely unmetabolized methoprene, reaching a high of 3.87 ppm in muscle tissue 14 days after an initial exposure to 0.31 ppm, but the residues were rapidly eliminated (over 90%) within 2 weeks when fish were transferred to flowing, uncontaminated water. The fish accumulated much smaller residues in the model ecosystem, which contained other organisms. However, analysis of the ecosystem samples was greatly complicated because components of the ecosystem degraded methoprene extensively to generate nonmetabolic residues. Residual radioactivity was found almost exclusively in radiolabeled natural products, including cholesterol, free fatty acids, glycerides, and protein. Less than 1% of the total radioactivity in ecosystem fish could be attributed to unmetabolized methoprene or its primary metabolites. Thus, a simple radioassay procedure alone was not sufficient for such analysis in a model ecosystem.

77-0635. Wallerstein, I. S.; Jacoby, B.; Dinoor, A. (Dep. Agric. Bot., Hebrew Univ., Rehovot, Israel). **Absorption, retention and translocation of the systemic fungicide triarimol in plants.** *Pestic. Biochem. Physiol.* 6(6): 530-537; 1976. (24 references)

Only 3% of the tritium-labeled triarimol absorbed by a bean leaf was transported from the application site to other leaf organs, and this was only 0.45% of the total amount applied. Thus, there was probably no significant fungitoxic effect except at the point of application. Triarimol was acropetally transported in the xylem sap of bean explants, but much of it was loosely bound in transit; the retention and accumulation of triarimol by plant tissues appears to be a nonmetabolic process resulting from weak binding to proteins. The translocation of triarimol that has been bound into apoplasts and symplasts was found to depend largely on the rate of water flux through the system.

77-0636. Davidse, L. C. (Res. Unit. Intern. Ther. Plants, Lab. Phytopathol., Agric. Univ., Wageningen, The Netherlands). **Metabolic conversion of methyl benzimidazol-2-yl carbamate (MBC) in *Aspergillus nidulans*.** *Pestic. Biochem. Physiol.* 6(6): 538-546; 1976. (34 references)

In mycelium of cultured *A. nidulans*, MBC was metabolized to methyl 5-hydroxybenzimidazol-2-yl carbamate which in turn was converted to a second metabolite that could not be identified. The highest conversion rate was attained when the culture was depleted of nutrients. Conversion was especially rapid and complete in aged, concentrated mycelial suspensions. Strains differing in MBC sensitivity metabolized MBC at equal rates.

77-0637. Evans, M. H. (A. R. C. Inst. Animal Physiol., Babraham, Cambridge, England). **End-plate potentials in frog muscles exposed to a synthetic pyrethroid.** *Pestic. Biochem. Physiol.* 6(6): 547-550; 1976. (7 references)

Multiple end-plate potentials appeared when isolated sartorius nerve-muscle preparations from *Rana temporaria* were exposed to a suspension of 5-benzyl-3-furylmethyl (+)-*cis*-chrysanthemate (NRDC 119) at 1 to 100 mg/l. The effect is believed due to repetitive activity arising in the motor nerve fibers, and not to any significant direct effect of acetylcholine release from motor nerve terminals, or on the kinetics of acetylcholine interaction with the end-plate receptors and the subsequent inactivation process. Thus, the muscle fiber membrane and the neuromuscular junction were ruled out as possible sites for the toxic action of pyrethroids in vertebrates.

77-0638. Huhtanen, K.; Dorough, H. W. (Dep. Entomol., Univ. Kentucky, Lexington, KY 40506). **Isomerization and Beckmann rearrangement reactions in the metabolism of methomyl in rats.** *Pestic. Biochem. Physiol.* 6(6): 571-583; 1976. (24 references)

Methomyl may exist in two geometric configurations; the *syn* isomer is more stable and is the form used as an insecticide. In the rat *syn*- methomyl labeled with carbon-14 at the imide carbon was metabolized to respiratory $^{14}CO_2$ and 14 radioactive acetonitrile in a ratio of about 2 to 1, while the *anti* isomer was metabolized predominately to the latter. These and other data support the contention that *syn* methomyl is partially isomerized to the *anti* isomer in the animal prior to hydrolysis of the ester linkage. After hydrolysis the *syn* oxime is further metabolized to $^{14}CO_2$ while the *anti* oxime is metabolized to acetonitrile. It is proposed that Beckmann rearrangement of the *syn* and *anti* oximes occurs prior to formation of carbon dioxide and acetonitrile.

77-0639. Kupfer, D.; Bulger, W. H. (Worcester Fdn. Exp. Biol., Shrewsbury, MA). **Studies on the mechanism of estrogenic actions of *o,p'*-DDT: interactions with the estrogen receptor.** *Pestic. Biochem. Physiol.* 6(6): 561-570; 1976. (18 references)

The action of *p,p'*-DDT has been shown to be that of a typical estrogenic compound. The binding of *o,p'*-DDT to the 4S site (but not the 8S moiety) in the uterine cytosol and the inhibition by *o,p'*-DDT of the binding of ^{3}H-E_2 to the 8S receptor were both demonstrated in mice

and rabbits. The binding of ^{3}H-E_2 was suppressed by 58% in ovariectomized adult mice given 2 μM *o,p'*-DDT, and by 39.5, 52.9, and 59.7% in immature rats at concentrations of 16, 32, and 96 μM, respectively. Similar results were obtained with uterine preparations from mature rats. A Scatchard plot analysis revealed that the *o,p'*-DDT caused a decrease in the ratio of bound to free E_2, indicating that *o,p'*-DDT binds to the receptor and interferes with E2 binding. The administration of *o,p'*-DDT to immature female rats caused an increase in the levels of uterine nuclear binding sites, a further indication that it acts as a typical estrogenic compound. It is not known whether *o,p'*-DDT as well.

77-0640. Roberts, T. R.; Stoyden, G. (Shell Res. Ltd., Woodstock Lab., Sittingbourne Res. Cent., Sittingbourne, Kent, England). **The degradation of (*Z*)- and (*E*)-1,3-dichloropropenes and 1,2-dichloropropane in soil.** *Pestic. Sci.* 7(4): 325-335; 1976. (4 references)

The degradation in soil of the major constituents of a 1,3-dichloropropene 1,2-dichloropropane nematicide has been studied under laboratory and outdoor conditions. In sealed glass containers, (Z)- and (E)-1,3-dichloropene-2-^{14}C were converted in soil into the corresponding 3-chloroallyl alcohols and these alcohols were in part strongly bound to the soil. The (Z)- and (E)-3-chloroacrylic acids were also found as minor products. More polar products were detected and these released the chloroacrylic acids in 20-30% yield upon hydrolysis. Although the 1,3-dichloropropenes were lost by volatilization from soil stored in open glass jars outdoors, they also underwent degradation to the same products that were detected in sealed containers. There was evidence of only slight degradation of 1,2-dichloropropane-2-^{14}C (4% or less of the applied radioactivity remained unextracted from a loam soil after 5 months). When soil treated with the 1,2-dichloropropane was stored outdoors in an open glass container, less than 1% of the original radiolabel remained in the soil after 10 days under these conditions due to volatilisation of the applied material. In a separate experiment potatoes were grown in soil 6 months after treatment with a mixture of both (Z)- and (E)-1,3-dichloropropene-2-^{14}C and 1,2-dichloropropane-2-^{14}C. Although 5% of the applied radiolabel remained in the soil at potato harvest the potato tubers contained only a very small residue (0.007 mg/kg). (Author abstract by permission)

77-0641. Verweij, A.; Boter, H. L. (Chem. Lab. TNO, Rijswijk, The Netherlands). **Degradation of *S*-2-di-isopropylaminoethyl *O*-ethyl methylphosphonothioate in soil: phosphorus-containing products.** *Pestic. Sci.* 7(4): 355-362; 1976. (12 references)

The degradation of *S*-2-di-isopropylaminoethyl *O*-ethyl methylphosphonothioate in humic sand, humic loam and clayey peat has been studied under laboratory conditions. About 90% of the compound disappeared within 2 days and the remainder disappeared more slowly. Ethyl hydrogen methylphosphonate and methylphosphonic acid were identified as the only phosphorus-containing degradation products. (Author abstract by permission)

77-0642. Stringer, A.; Wright, M. A. (Long Ashton Res. Stn., Univ. Bristol, Bristol, England). **The toxicity of benomyl and some related 2-substituted benzimidazoles to the earthworm *Lumbricus terrestris*.** *Pestic. Sci.* 7(5): 459-464; 1976. (20 references)

Benzimidazole and its 2-amino analogue were non-toxic to *Lumbricus terrestris* when administered orally. The fungicidal 2-substituted benzimidazoles (benomyl, carbendazim, fuberidazole and thiabendazole) and 1-(benzimidazol-2-yl)-3-butylurea were highly and equally toxic. The equitoxicity of compounds with widely differing substituent groups suggests a common mode of action, the benzimidazole moiety being the active part of the molecule. It is likely that there is a common mode of action for benzimidazole analogues for both fungicidal activity and earthworm toxicity. There was no detectable effect on the cholinesterase levels of earthworms poisoned by benomyl. But it is confirmed that the cholinesterase inhibitory activity of benomyl *in vitro* is due to formation of butyl isocyanate. (Author abstract by permission)

77-0643. Sieber, S. M. (Lab. Chem. Pharmacol., Natl. Cancer Inst., Natl. Inst. Health, Bethesda, MD). **The lymphatic absorption of *p,p'*-DDT and some structurally related compounds in the rat.** *Pharmacology* 14(5): 443-454; 1976. (26 references)

The lymphatic absorption of *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDD, *o,p'*-DDD, DDE, DDA, and 2,4-D was studied in thoracic-duct cannulated rats using ^{14}C-labeled compounds. Compounds were administered as dilute ethanol solution at a dose of 10 μgmol/kg; thoracic duct lymph was collected for analysis 24 hours after dosing. For the *p,p'*- and *o,p'*-isomers of DDT and DDD and for DDE, 12% or more of the ^{14}C activity was recovered in lymph, which represents extensive absorption, since blood flow is about 500 times greater than lymph flow in the capillaries of the intestinal villus. Most of the reactivity from *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDD, and *o,p'*-DDD was attributable to the administered compounds and not to labeled metabolites, despite the fact that these compounds are known to be extensively metabolized in rats, suggesting that the compounds entered the lymph by direct absorption at the lacteal. The lipid solubility, lymphatic absorption, urinary and bile excretion, and localization in body fat differed widely for the compounds tested. No strict parallel between lipid solubility and lymphatic absorption was observed, possibly because of differences in the rates and routes of excretion.

77-0644. Peeples, J. J.; Curl, E. A.; Rodriguez-Kabana, R. (Dep. Bot. Microbiol., Auburn Univ. Agric. Exp. Stn.,

Auburn, AL). **Effect of the herbicide EPTC on the activity of *Trichoderma viride* against *Sclerotium rolfsii*.** *Plant Dis. Rep.* 60(12): 1050-1054; 1976. (10 references)

The ability of *T. viridae* to antagonize the pathological activity of *S. Rolfsii* was reduced in sterilized soil containing EPTC (eptam). The invertase activity in soil containing a mixed culture of *S. rolfsii* and *T. viridae* was significantly lower than in a monoculture of *S. rolfsii* after both were treated with 2.5 and 40 μ/g EPTC. However, the use of EPTC in nonsterilized soil at recommended field rates increased the severity of *S. rolfsii* damage to ladino clover and cotton seedlings. It appears that, whereas EPTC in a dual culture may enhance the inhibitory effect of *T. viridae* against *S. rolfsii*, under less than optimal field conditions the herbicide may increase predisposition to disease.

77-0645. Iyer, J. G.; Wojahn, K. E. (Dep. Soil Sci., Univ. Wisconsin, Madison, WI). **Effect of the fumigant dazomet on the development of mycorrhizae and growth of nursery stock.** *Plant Soil* 45(1): 263-266; 1976. (9 references)

Soil factors that affect the vulnerability of mycorrhiza-forming fungi to the fumigant Dazomet (DMTT, Mylone 50 D) were studied in terms of adverse effects on the growth of nursery stock. Nursery beds were treated with 400 kg/hectare (200 kg/hectare active ingredient) Dazomet 40 days prior to seeding with red pine and white pine. The usual period of detoxification prior to seeding is 60 days. Plants from the beds planted only 40 days after application of the chemical showed stunted development, and this was especially evident among plants from low-elevation, depressed parts of the beds, which displayed grossly retarded roots and an absence of the mycorrhizal short roots that are induced by the fungus *Cenococcum graniforme*. This condition was apparently aggravated by the low temperatures (below 10 degrees C) during the short detoxification period, and by a low supply of soil organic matter, conditions that make the fungi more vulnerable to the toxicant. A critical demycorrhization of nursery stock has been observed in Wisconsin for many years in soils with organic content of less than 1.5% in the 15-cm surface layer.

77-0646. Traczyk, Z.; Arczynska, E.; Wit, B.; Gorska, B.; Rudowski, W. **Hamowanie migracji leukocytow pod wplywem DDT i gamma-HCH. [Leucocyte migration inhibition in the presence of DDT and gamma-HCH.]** *Pol. Tyg. Lek.* 31(41): 1753-1755; 1976. (19 references) (Polish)

Leucocyte migration was significantly inhibited in 2 of 5 patients with pancytopenia and 1 with chronic lymphocytic leukemia, but not among healthy subjects, when all were exposed to DDT and gamma-HCH (lindane). This indicated definite lymphocyte sensitization to these substances.

77-0647. Reading, C. M.; Arscott, G. H.; Tinsley, I. J. (Dep. Poult. Sci., Oregon State Univ., Corvallis, OR). **Effect of dieldrin and calcium on the performance of adult Japanese quail (*Coturnix coturnix japonica*).** *Poult. Sci.* 55(1): 212-219; 1976. (25 references)

Two experiments were conducted to determine the effects of dieldrin and calcium on reproductive performance of quail. At 25% egg production the quail received diets containing 0, 10 or 25 p.p.m. of dieldrin for six, 28-day periods in experiment 1 and 0. 5, or 25 p.p.m. of dieldrin for four, 28-day periods in experiment 2. Pesticide treatments were employed with diets containing 0.5% and 3.0% calcium. The results show that egg shell thickness, cracked eggs, egg production, feed consumption, egg weights, fertility, hatchability and body weights were not affected by dieldrin treatments. However, egg shell thickness, cracked eggs, egg production and hatchability were adversely affected by the lower calcium level. Female body weights were consistently heavier for the low calcium diet. Mortality increased in the presence of 10 and especially 25 p.p.m. of dieldrin. Livability of chicks from hens receiving rations with 10 and 25 p.p.m. of dieldrin was significantly lower than those fed no dieldrin. In summary, dieldrin was without effect on egg shell quality or other reproductive factors but did exert a detrimental effect on adult mortality and livability of progeny. (Author abstract by permission)

77-0648. Janda, J. (Forestry Game Manage. Res. Inst., Zbraslav, Czechoslovakia). **Ucinek novych pesticidnich pripravku (birlane EC24, chlorophacinon, nexion saatgutpuder) na drobnou zver. [Effects of new pesticides (birlane EC24, chlorophacinone, nexion saatgupuder) on small game.]** *Pr. VULHM* (46): 107-120; 1974. (16 references) (Czech)

The LD50 of three new pesticides (Birlane EC24 or chlorfenvinphos, chlorophacinone, and Nexion Saatgutpuder containing bromophos) were determined for pheasants, partridges, and rabbits. The LD50 for birlane EC24 was 384.6 mg/kg for pheasants and 616.6 mg/kg for hares; the LD50 for Nexion Saatgutpuder was 1879.0 mg/kg for pheasants and 630.0 mg/kg for partridges; the LD50 for chlorophacinone on wheat was 35-45 mg/kg for pheasants and partridges. All three pesticides were toxic to the game animals studied, and the animals were not repelled by the chemicals, but accepted then in feed. Concentrations suggested for use on crops are not, however, expected to be toxic to pheasants, partridges, and hares.

77-0649. Mendoza, C. E.; Shields, J. B.; Laver, G. W. (Food Res. Div., Chem. Saf. Bur., Food Dir., Health Prot. Branch, Health Welfare Canada, Ottawa, Canada). **Body burden of hexachlorobenzene and its effects on some esterases in tissues of young male rats.** *Toxicol. Appl. Pharmacol.* 38(3): 499-506; 1976. (25 references)

Feeding male Wistar rats 50 or 100 ppm HCB in the diet for 62 days evoked induction of liver esterase activity

toward thiophenyl, *p*-nitrophenyl, and indophenyl acetates. The induction rate, as well as the HCB residues in liver, brain, kidney, and heart were dose-dependent. An increase in esterase activity toward thiophenyl acetate was also observed in the kidney at the 100 ppm HCB level. Serum esterase activity toward malaoxon was elevated at 50 and 100 ppm HCB and that toward paraoxon was increased at 100 ppm. Liver esterase hydrolysis of malaoxon was induced only at 100 ppm HCB. Under the conditions used, the rats fed 10 ppm HCB were observed to be similar to the controls; the concentrations of HCB residues found in the liver, brain, kidney, and heart were dose dependent. (Author abstract by permission)

77-0650. Braun, W. H.; Sauerhoff, M. W. (Health Environ. Res., Dow Chemical, Midland, MI). **The pharmacokinetic profile of pentachlorophenol in monkeys.** *Toxicol. Appl. Pharmacol.* 38(3): 525-533; 1976. (7 references)

Pentachlorophenol (PCP) is a registered antimicrobial agent used widely for the preservation of wood. The pharmacokinetic profile of PCP has been defined in the Rhesus monkeys. Three male and three female monkeys were given a single oral dose of 10 mg/kg [^{14}C]PCP in corn oil. Concentrations of PCP were determined in plasma and urine at selected time intervals through 360 hr post-administration. There were apparent sex-related differences in the first order clearance of PCP from plasma and excretion in urine. The half-life value for clearance of PCP from plasma was 83.5 hr for females and 72.0 hr for males while the half-life value for excretion was 92.4 and 40.8 hr for females and males, respectively. Essentially all of the ^{14}C activity excretion and enterohepatic circulation were the probable explanations for the long half-life of PCP in the body of monkeys. (Author abstract by permission)

77-0651. Pritchard, J. B. (Dep. Physiol., Med. Univ. South Carolina, Charleston, SC). ***In vitro* analysis of 2,2-bis(*p*-chlorophenyl) acetic acid (DDA) handling by rat kidney and liver.** *Toxicol. Appl. Pharmacol.* 38(3): 621-630; 1976. (26 references)

On exposure of renal cortical slices or liver slices to [^{14}C]DDA (2,2-bis[*p*-chlorophenyl] acetic acid), both tissues accumulate DDA in a concentration- and time-dependent manner. At 10 μM DDA maximum tissue to medium ratios were approximately 20 in both tissues. Incubation under N_2 or addition of metabolic inhibitors reduced uptake by 50%. Other organic acids depressed energy-dependent DDA uptake, but did not influence uptake in the presence of metabolic inhibitors. Neither the parent pesticide, DDT (1,1,1-trichloro- 2,2-bis[*p*-chlorophenyl] ethane), nor organic bases significantly inhibited DDA accumulation. Accumulation of a second organic acid, *p*-aminohippurate (PAH), was depressed by DDA but not by DDT. Thus, DDA is apparently accumulated by an energy-dependent carrier-mediated process in both liver and kidney. The specificity of this process indicates that it is the organic acid transport system. (Author abstract by permission)

77-0652. Abou-Donia, M. B.; Preissig, S. H. (Dep. Physiol. Pharmacol., Duke Univ. Med. Cent., Durham, NC). **Delayed neurotoxicity from continuous low-dose oral administration of leptophos to hens.** *Toxicol. Appl. Pharmacol.* 38(3): 595-608; 1976. (40 references)

Delayed neurotoxicity in hens was produced following daily oral administration of subneurotoxic does, i.e., 1, 2.5, 5, 10, and 20 mg/kg of leptophos [*O*-(4-bromo-2,5- dichlorophenyl) *O*-methyl phenylphosphonothioate] in gelatin capsules for 60 days or until ataxia developed. A "no-effect" dose was found to be 0.5 mg/kg. Severity of the clinical condition depended on the size of the daily ingested dose, i.e., while paralysis was permanent after large doses, it was temporary after smaller doses. Duration of administration and "total dose" before onset of ataxia depended on the daily dose. The effect was not only cumulative but the total dose required to produce ataxia decreased with decrease of the daily dose. Degeneration of myelin and axons was seen in spinal cords and sciatic nerves of intoxicated birds. The extent of change varied with increasing dose. Paralyzed hens had significant histologic alteration while ataxic birds exhibited only mild changes. Red blood cell acetylcholinesterase was inhibited and recovered when the administration of leptophos had stopped. On the other hand, plasma cholinesterase, after initial inhibition and recovery, was severely inhibited as the signs of neurotoxicity progressed. (Author abstract by permission)

77-0653. Hanig, J. P.; Yoder, P. D.; Krop, S. (Div. Drug Biol., Food Drug Admin., Dep. Health, Educ., Welfare, Washington, DC). **Convulsions in weanling rabbits after single topical application of 1% lindane.** *Toxicol. Appl. Pharmacol.* 38(3): 463-469; 1976. (20 references)

There have been sporadic reports of adverse effects of lindane (γ-hexachlorocyclohexane) in children treated for scabies. These effects usually consisted of tremors, convulsions, anorexia, and possible stunting of growth. Weanling rabbits (6 weeks old; 1.0 kg) given a single topical application of 1% lindane at a dose reportedly used in infants (60 mg/kg) exhibited severe anorexia and convulsions; death occurred in some cases. The effects were more pronounced in weanlings in which the skin was inflamed or not completely intact. In contrast, young adult rabbits (2-3 kg) given the same dose showed only some anorexia and possibly mild excitement. Concentrations of lindane in whole blood of weanlings at the time of convulsions (approximately 24 hr after dosing) ranged from 0.7 to 2.5 μg/ml. These findings suggest a rather pronounced sensitivity of weanlings to lindane in comparison to adults. (Author abstract by permission)

77-0654. Smith, F. A.; Schwetz, B. A.; Nitschke, K. D. (Toxicol. Res. Lab., Health Environ. Res., Dow Chem.,

Midland, MI). **Teratogenicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in CF-1 mice.** *Toxicol. Appl. Pharmacol.* 38(3): 517-523; 1976. (9 references)

The effect of TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin) on the developing embryo and fetus of CF-1 mice has been evaluated. Pregnant CF-1 mice were given TCDD by oral gavage on days 6 through 15 of gestation at dosages of 0, 0.001, 0.01, 0.1, 1, and 3 μg/kg/day. Little or no maternal toxicity was observed at any dosage. Cleft palate and dilated renal pelvis were found at 3.0 μg/kg/day. Cleft palate was found at 1.0 μg/kg/day. No malformations were found at the intermediate dosages of 0.1 or 0.001 μg/kg/day. Teratogenic effects observed, i.e., cleft palate and dilated renal pelvis, were comparable to those seen in studies utilizing other strains of mice. The incidence of malformations was not statistically significant at the 0.1-μg/kg/day dosage and below. The experimental non-teratogenic dosage for TCDD in the developing embryo and fetus of CF-1 mice was estimated to be 0.1 μg/kg/day. (Author abstract by permission)

77-0655. Fujitani, C. (Fresh Water Dep., Regional Fish. Res. Lab., Fish. Ag., Min. Agric. For., Hino, Tokyo, Japan). [**Effects of pesticides on aquatic organisms.**] *Proc. Symp. Pestic. Sci.* 9:33-34; 1976. (Japanese)

Recently, Japanese fishery practice has shown a tendency to change from fish gathering to fish breeding. The latter means collecting eggs, incubating them artificially and rearing the young, stocking streams with the young fish, then harvesting them later. In these processes, complex control of environmental conditions is necessary, and control of water quality is especially necessary. Incidents of acute intoxication of aquatic organisms including fishes have been reduced recently; however, no satisfactory measures against chronic toxicity of pesticides to such organisms have yet been established. A case of paralysis of the lateral nerves of goldfish kept in an aqueous 5 ppb solution of dieldrin for three years was described. The higher amount of water (700 m/kg/day) required to supply the oxygen necessary for the metabolism of a rainbow trout would correspond to accumulation of pesticides in the water to 700 fold in a day. This factor of pesticide accumulation in fish body is far greater than the factor due to ingestion.

77-0556. Odashima, N. (Dep. Pharmacol. Pathol., Nat. Inst. Hyg. Sci., Tokyo, Japan). [**Carcinogenicity of chemical substances.**] *Proc. Symp. Pestic. Sci.* 9: 25-26; 1976. (3 references) (Japanese)

A carcinogenic substance may be defined as a natural or artificially synthesized substance which causes carcinoma in more than one species of small laboratory animals used for medical experiments. It is believed that such substances will also cause human cancer, because almost all those substances which are regarded as causative agents for occupational cancer display carcinogenicity in laboratory animals. Recently discovered facts concerning the mechanism of carcinogenesis by such substances, the antagonism between carcinogenic substances (Richardson's effect), and the existence of threshold levels of such substances, the exposure to which will not actually cause cancer are discussed. It is difficult to calculate the safe levels of such substances for human beings from the maximum non-cancer-causing amounts for laboratory animals. An outline of the method of assessing carcinogenicity of substances, as presented by U.S. National Cancer Institute was introduced. The authors belief that the newly developed substances must be evaluated as to their carcinogenicity and that the method of evaluation must be able to withstand international criticism.

77-0657. Kitamura, M.; Hayakawa, K.; Shibata, Y. (Sch. Pub. Health, Fac. Med., Kobe Univ., Kobe, Hyogo, Japan). [**Experimental studies on the accumulation and decline of BHC in fish.**] *Nippon Eiseigaku Zasshi* 31(1): 157; 1976. (Japanese)

Goldfish were reared in an aqueous solution containing α-, β-, and γ-BHC at 0.02 ppm for 3 days, 1, 2, 3, 4, 5, 6, 7, and 9 weeks then transferred to pure water, and one week after transfer. The content of BHC isomer in the fish body was determined immediately. Other gold fish were similarly reared for 5 weeks and the BHC content determined 4 and 8 hr and 1-7 days after transfer into pure water. Still other gold fish and carp were reared as mentioned as above, and after apparently reaching saturation with BHC the local distribution of BHC was determined. Some of them were transferred into pure water to determine the decreased distribution. At longer rearing periods (over 6 weeks) the accumulation peak showed a reduction for each isomer of BHC. After one week in pure water only beta-BHC residues continued to increase as the rearing period in the solution was prolonged. When fish were transferred into pure water, α- and γ-BHC decreased to 1/4 - 1/5 of the maximum and beta-BHC decreased to 1/3 of the highest value within a few hr, then showed no noticeable decrease thereafter. The accumulation was highest in the brain, followed by the skin and the intestine (including the mesentery) just before transferring. The decrease was fastest in the skin, but in muscle (dorsal) inspite of low accumulation, the decrease was slowest.

77-0658. Konno, A. (Intern. Med. Inst. Acid Fast Bacteria, Tohoku Univ., Sendai, Miyagi, Japan). [**Lung fibrosis.**] *Nippon Kyobu Shikkangakkai Zasshi (Jpn. J. Thorac. Dis.)* 14(Suppl.): 6; 1976. (Japanese)

In order to explain the mechanism of pulmonary fibrosis, experimental fibrosis was induced in rats. Paraquat dichloride was injected intraperitoneally into the rats, and the changes were followed ultramicromorphologically and biochemically. At first, epithelial injury and thickening of alveolar walls were observed. After one week, the formation of collagen fibers was found around the fibroblasts. The dry weight of the lungs increased as 2-fold DNA increase; however, RNA increased 4.5 times,

indicating an increase of protein synthesis rather than cell division. The total amount of pulmonary collagen became 2 times greater than that of intact lung.

77-0659. Editorial Committee of Agricultural Chemicals Handbook. (Japan Plant Protect. Assoc., Tokyo, Japan). [**Explanation of recently registered pesticides: herbicides.**] *Noyaku Benran (Agric. Chem. Hand.)* Tokyo 1976, pp. 334-344. (Japanese)

Six herbicides, dimron ((1-α, α-dimethylbenzyl)-3-(*p*-tolyl) urea)), cyprazine (2-chloro-4-cyclopropylamino-6- isopropylamino-*s*-triazine), benoxazole-simetryne ((2-(2-chlorobenzylthio)- 5-propyl-1,3,4-oxadiazole plus simetryne)), cypromide ((N-(3,4-dichlorophenyl) cyclopropane carboxamide)), orthobencarb ((5-(2-chlorobenzyl)- *N,N*-diethylthiocarbamate)), and bentazon (3-isopropyl-2,1,3-benzothiadiazine-(4)-2,2-dioxide) were introduced ane explained. Acute oral LD50 values to male and female mouse and male and female rat respectively are given below: more than 1400, and more than 4000, and (dimron); 1306, 1056, 516, 516(cyprazine); 1270, 1030, 2780, 2860 (benoxazole); 1330, 1580, 2333, 1860 (cypromide); 1000, (orthobencarb); and 1320, 1130, 1100, 1100 mg/kg (bentazone). Their TLm (48 hr) values are, in the above order, more than 40, 25, 2.8 (benoxazole), 3.5, 2.8 and more than 40 ppm, respectively.

77-0660. Editorial Committee of Agricultural Chemicals Handbook. (Japan Plant Protect. Assoc., Tokyo, Japan). [**Explantation of recently registered pesticides: insecticides.**] *Noyaku Benran (Agric. Chem. Handb.)* Tokyo, 1976, pp. 321-329. (Japanese)

Colophonate ((*S*-(5-chloro-1,3-thiazolyl) methyl dimethyl phosphorothiolothionate), used against rice stem borer, chloropyrifos-methyl (*O,O*-dimethyl *O*-3,5,6-trichloro-2-pyridyl phosphorothioate), used against rice stem borer and vegetable pests; amitoraz ((3-methyl- 1,5-bis (2,4-xylyl)-1,3,5- triazapenta-1,4-diene)) used against mites; and prothiophos (*O*-2,4-dichlorophenyl *O*-ethyl 5-propyl phosphorodithioate), used against a wide range of pest insects, were explained. The acute p.o. LD50 to male and female mouse and male and female rat were given as follows in the above order: 1180, 1120, 760 and 830; 2254, 2032, 2472 and 1828; 1460, 1420, 450 and 370; and 940, 960, 1700 and 1750 mg/kg. The acute dermal LD50 values exceeded 2000 mg/kg in both sexes and species for colophonate and chlorpyrifos-methyl. Amitoraz had an acute dermal LD50 of 1600 mg/kg for male mice and the acute dermal LD50 of prothiophos ranged from 1600 to 4100 mg/kg. The TLm (48 hr) to carp is 7.8, 2.1, 2.5 and 9.5 ppm, respectively.

77-0661. Editorial Committee of Agricultural Chemicals Handbook. (Japan Plant Protect. Assoc., Tokyo, Japan). [**Explanation of recently registered pesticides: fungicides.**] *Noyaku Benran (Agric. Chem. Handbook)* Tokyo, 1976, pp. 330-333. (Japanese)

Dibendazol ((methyl 1-(ω-cyanopentylcarbamoyl)-2-benzimidazole carbamate)), a general fungicide and seed disinfectant, and dimethirimol (5-butyl-2-dimethylamino-6- methylpyrimidine-4-ol), a fungicide against powdery mildew, were introduced and explained. The acute oral LD50 of dibendazol to male and female mouse, and male and female rat was more than 2500 mg/kg. The acute oral LD50 of dimethirimol to male mouse and male rat respectively was 1390 and 1250 mg/kg. The acute dermal LD50 of dibendazol to rat is more than 500 mg/kg. Ther dermal toxicity of dimethirimol is low. The TLm (48 hr) to carp is 6.5 for dibendazol and more than 50 ppm for dimethirimol. The toxicity of both compounds to small crustceans is low.

77-0662. Yoshida, K.; Takahashi, K. (Agric. Chem. Inspect. Stn., Min. Agric. Forestry, Kodaira, Tokyo, Japan). [**Application list of newly registered pesticides (agricultural chemicals).**] *Kongetsu No Noyaku (Pestic. Mon.)* (11): 90-109; 1976. (Japanese)

Names, trade names, active ingredient content, type of formulation, names of crops to be treated, names of pests to be controlled, use dilution for application, time limit of application, seasons of application, and methods of application as well as the mammalian toxicity classification were tabulated for newly registered pesticides as of Aug. 15, 1976. When these pesticides are applied in accordance with the indications listed in this table, no pesticide residue problems will ensure. The table lists 68 insecticides and acaricides (some containing more than one active ingredient), and 55 fungicides and bactericides.

77-0663. Hanyu, H.; Kamiji, M.; Kanazawa, J. (Tochigi Prefect. Agric. Exper. Stn., Utsunomiya, Tochigi, Japan). [**Fate of *O*-*sec*-butylphenyl *N*-methylcarbamate in water, soil, and carp body after its application on rice plants in paddy field.**] *Nippon Nogei Kagaku Kaishi (J. Agric. Chem. Soc. Jpn.)* 50(10): 98; 1976. (Japanese)

When *o*-*sec*-butylphenyl *N*-methylcarbamate was applied as 5% dust on rice plants late in August for controlling *Nephotettix cincticeps* on water, soil, and carp in the downstream of the field were investigated, the dose rate being 4-8 kg dust/10 are. The findings showed that the residual amount of the insecticide in irrigation water of the field and in soil of the field was very small. When compared to DDT and diazinon, its residual toxicity to carp was higher in spite of the lower biological concentration ratio in the fish.

77-0664. Hilscher, W.; Fabricius, G. (Gesellsch. Foerderung Lufthyg. Silikoseforsch. e.V., Duesseldorf, Germany). **Die Keimbahn und ihre Schaedigung durch die Umwelt.** [**The germ cell line and the damage done to it by environmental factors.**] *IN: Lufthygiene und*

Silikoseforschung (Air quality and silicosis research). Medizinisches Institut fuer Lufthygiene und Silikoseforschung, Jahresbericht 1975, Vol. 8, Verlag W. Girardet, Essen, 1976, pp. 139-163. (95 references) (German)

The germ cell line was delineated and investigated beginning in the last century. Environmental factors capable of disrupting the integrity of the germ cell line at various points in various species have been investigated: greatest attention has been devoted to ionizing radiation, cytostatic drugs, heavy metals, and pesticides. The impairment of reproduction in birds by DDT was the first major observation made in this connection, and many other pesticides were also examined experimentally and epidemiologically in birds. Eggshell thinning represents the best known reproductive effect of organochlorine pesticides, but extensive disorders of embryonic development have also been demonstrated.

77-0665. Rohleder, K.; Rohr, K.; Daenicke, R. (Inst. Tierernaehr. Forschungsanst. Landwirtsch. Braunschweig-Volkenrode, Volkenrode, Germany). **Untersuchungen zum Uebergang von Hexachlorobenzol (HCB) in Kuhmilch. [Carryover of hexachlorobenzene into cows' milk.]** *Milchwissenschaft* 31(7): 416-419; 1976. (23 references) (German)

The carryover of hexachlorobenzene (HCB) into cows' milk was studied after oral and intraruminal administration. Administration of HCB at 39 mg per cow per day for 15 days resulted in maximum HCB levels of 6.5 mg HCB per kg butterfat, while administration at 50 mg per cow per day for 10 days resulted in 3.8 mg/kg butterfat. The HCB values exceeded the established limit of 0.05 ppm (fat basis) for about 100 days. Excretion via the milk accounted for less than 5% of the total intake during the administration period and 20-30% during the entire lactation period. A slight increase in the HCB concentration of the milk was found after calving, at the beginning of the next lactation period. Higher HCB levels were found in tissues of the 90-day-old calf of a contaminated cow than in a control calf of the same age.

77-0666. Smith, S. N.; Lyon, A. J.; Sahid, I. B. (Dep. Bot., Univ. Sheffield, Sheffield S10 2 TN, England). **The breakdown of paraquat and diquat by soil fungi.** *New Phytol.* 77(3): 735-740; 1976. (10 references)

Radiolabeled paraquat (labeled with 14-C on the methyl group) or diquat (labeled with 14-C on the ethyl group) were incubated with *Mucor hiemalis, Zygorhynchus hetergamous, Aspergillus niger* and *Penicillium frequentans*. The label was released as $^{14}CO_2$ from both herbicides by *Aspergillus niger* and only from paraquat by *Penicillium frequentans*. The other fungi, *Mucor hiemalis* and *Zygorhynchus heterogamous*, were not able to release $^{14}CO_2$ from either herbicide. The species which are able to degrade paraquat develop low intracellular levels of the herbicides and are able to tolerate high concentrations of them in the medium. Species unable to degrade the herbicides, on the other hand, are characterized by high intracellular pesticide levels and by an inability to grow in the presence of low herbicide levels. Therefore the quality of herbicide tolerance seems to be due to an ability to degrade the herbicides.

77-0667. Hartley-Asp, B. (Dep. Genet. Plant Breeding, Roy. Agric. Coll., Yppsala, Sweden). **Enhancement by methylated oxypurines of the frequency of induced chromosomal aberrations. IV. The dependence of the potentiation on the type of material.** *Hereditas* 83(2): 223-226; 1976. (59 references)

An increased frequency of chromosomal aberrations induced by mitomycin C and thio-tepa was seen in root tips of *Vicia faba, Allium proliferum*, and *Nigella damascena* and cells of *Cricetulus griseus* and *Potorous tridactylis*. The abnormalities were observed prolonged after aftertreatment with caffeine at 5 x $10^{-4}M$ and various fixation times. The most sensitive period for caffeine potentiation, demonstrated for *Vicia faba*, occurred at 9-12 hr after the beginning of the inducer treatment. This period corresponded to the middle-late S phase after mitomycin C treatment in *Vicia faba* root tips. Synergism was also evident after maleic hydrazide plus caffeine exposure in *Vicia faba* and *Allium proliferum* root tips. *Vicia faba* root tips and Chinese hamster cells (*Cricetulus griseus*) both had the same threshold value for caffeine potentiation after mitomycin C; the value was between 2 and 3 x $10^{-4}M$. The potentiation factor was higher for thio-tepa than for mitomycin C in all materials except *Allium proliferum*.

77-0668. Kexel, H.; Limbach, B.; Schmelz, E.; Schmidt, H. L. (Lehrst. Allg. Chem. Biochem., Techn. Univ. Muenchen, D-8050 Freising-Weihenstephan, Germany). **Zur Sauerstoffuebertragung bei der mikrosomalen oxidativen Desulfurierung. [Oxygen transfer during microsomal oxidative desulfuration.]** *Hoppe-Seylers Z. Physiol. Chem.* 357(8): 1034-1035; 1976.

As is the case with other mixed-functional oxidations the sulfoxidation of *p*-thioanisidine and thioacetamide by liver microsomes takes place with incorporation of an oxygen atom from O_2 into the reaction product. It has also been found, taking the oxidation of diphenylthiourea and parathion as an example, that microsomes replace the sulfur atom in these substrates with an oxygen atom from O_2. Model systems were set up for evaluating the mechanism of these reactions; the systems used were those capable of transferring oxygen from various compounds into S-containing substrates. A nonenzymatic reaction with ^{18}-labeled peracetic acid demonstrated that oxygen from a peroxo group is capable of replacing the sulfur in the two substrates mentioned. Microsomes can also catalyze corresponding substitution by oxygen from labeled cumene hydroperoxide. Attempts to transfer the oxygen atom from N-oxides using microsomal

systems were unsuccessful. The model system used in this case was the hemoglobin-catalyzed isomerization of *N,N*-dimethylaniline oxide to *o*-aminophenol. It was demonstrated, using rearrangement of double-labeled N-oxide, that this reaction takes place in the form of an intramolecular oxygen migration.

77-0669. El-Refai, A.; Fahmy, F. A.; Abdel-Lateef, M. F. A.; Imam, A. K. E. (Fac. Agric., Al-Azhar Univ., Cairo, Egypt). **Toxicity of three insecticides to two species of fish.** *Intl. Pest Contr.* 18(6): 4-8; 1976. (12 references)

The acute toxicity of chlorpyrifos, endrin, and methomyl was examined in carp and tilapia of two weight classes in standing water tests. The TLm values and confidence limits at 12, 24, and 48 hr were examined on fish at two different body weight ranges. Endrin was consistently most toxic, with 24-hr TLM values of 1.75 and 3 μg/liter for small and large carp and 1.60 and 2.82 μg/liter for small and large tilapia. Methomyl was least toxic, with 24-hr TLm ranging from 1.054 mg/liter to 3.16 mg/liter for tilapia and carp. Toxicity of chlorpyrifos was intermediate, at 0.084 mg/liter to 0/310 mg/liter for tilapia and carp. The body weight of the fish was closely correlated with the toxicity of the insecticides. Alum coagulation of insecticide-contaminated Nile water improved the water quality 1.3 fold for methomyl, 1.33 fold for chlorpyrifos, and 1.67 fold for endrin. Sand filtration was ineffective in removing insecticides from contaminated water.

77-0670. Highman, B.; Gaines, T. B.; Schumacher, H. J.; Haley, T. J. (Dep. Pathol., Univ. Arkansas Med. Cent., Little Rock, AR). **Strain differences in histopathologic, hematologic, and blood chemistry changes induced in mice by a technical and a purified preparation of 2,4,5-trichlorophenoxyacetic acid.** *J. Toxicol. Environ. Health* 1(6): 1041-1054; 1976. (7 references)

Groups of pregnant and nonpregnant CD-1 mice and male and nonpregnant female dihybrid cross F_2 mice were given 2,4,5-T at 30-140 mg/kg per day by gavage. A total of 978 mice including controls were studied, and treatment was administered on days corresponding to days 6-14 of pregnancy. Some of the groups were given a technical preparation containing 97.9% 2,4,5-T and some a purified preparation containing 99% 2,4,5-T. Sick or moribund mice sacrificed after 2-9 doses of 2,4,5-T often displayed severe myocardial lesions, hypocellularity of the bone marrow, and depletion of lymphocytes in the thymus, spleen, or lymph nodes. Severe hematologic and blood chemistry changes were also seen in these mice. Treated mice that remained healthy showed few or no lesions or blood chemistry changes, but they often developed a mild anemia due to the hemolytic effect of 2,4,5-T. Less than 1% of the CF-1 mice became moribund, including those receiving 140 mg/kg, while 53-82% of the male and female F_2 mice given 2,4,5-T at 120 mg/kg became moribund. Male mice seemed more susceptible than female mice, and the pure compound was more highly toxic than the technical preparation. The findings indicate that impairment of maternal health is not the primary cause of the increased fetal abnormalities in mice given 2,4,5-T, and they illustrate the importance of using more than one mouse strain in toxicologic studies.

77-0671. Rhodes, M. L.; Zavala, D. C.; Brown, D. (Pulmonary Div., Dep. Intern. Med., Univ. Iowa Coll. Med., Iowa City, IA 52242). **Hypoxic protection in paraquat poisoning.** *Lab. Invest.* 35(5): 496-500; 1976. (25 references)

More than 120 human fatalities have been caused by paraquat, mostly with manifestations of respiratory failure on the basis of pulmonary edema, hemorrhage, and atelectasis, or subsequent fibrosis. Paraquat concentrates in lung tissue and appears to cause superoxide radical formation in the presence of oxygen and electron donors. The therapeutic efficacy of a reduced oxygen environment was investigated by exposing paraquat-poisoned mice to 10% oxygen after stepwise reduction from a 14% oxygen atmosphere. Paraquat was administered by intraperitoneal injection to 61 mice at 27 mg/kg. The mortality rate was 32% in a group of mice kept under hypoxic conditions for 7 days, to a 78% mortality rate for those kept in normal atmosphere. The mortality rate of hypoxic mice was 25% and of controls 51% when the animals were given paraquat at 20 mg/kg. Brief exposure of the hypoxic group to room air led to pulmonary edema and death.

77-0672. Rodriguez Garay, E. A.; Morisoli, L. S.; Spetale, M. D.; Rassero, J. A. (Dep. Fisiol., Fac. Cienc. Bioquim., Univ. Nac. de Rosario, Rosario, Argentina). **Efecto del parathion sobre la function hepatica en ratas con dieta normal y libre de proteinas.** [**Effect of parathion on liver function in rats on normal and protein-free diets.**] *Medicina (Buenos Aires)* 35(6): 571-572; 1975. (Spanish)

Parathion, dissolved in propylene glycol, was administered i.p. in a single dose of 0.25 mg/100 g. This dosage proved fatal to rats on a protein-free diet, so it was reduced to 0.125 mg/100 g. Parathion treatment of the rats resulted in significant reduction of the bile flow and of the biliary excretion of bilirubin and bromsulfalein, and increases in the retention of these pigments in the serum. The acetylcholinesterase activity decreased while the serum β-glucuronidase increased extremely. The hepatic biliribin transport capacity was reduced somewhat. Parathion produced a significantly greater change in hepatic bromosulfalein transport in animals on a protein-free diet. The bilirubin glucuronyltransferase in the livers of rats treated with parathion was approximately halved in comparison to controls. Pretreatment with phenobarbital significantly increased bilirubin glucuronyltransferase in testicles and liver of treated rats. The results suggest that the pesticide used interferes with important aspects of protein liver function, and that the lack of dietary protein intensifies the effects.

77-0673. Avrahami, M.; White, D. A. (Wallaceville Anim. Res. Ctr., Upper Hutt, New Zealand). **Residues in milk of cows after spot treatment with ^{32}P-fenthion.** *N. Z. J. Exp. Agric.* 3(4): 309-311; 1975. (3 references)

Topical spot treatment with ^{32}P-fenthion was administered at the rate of 9 mg/kg body weight to two lactating dairy cows. The highest total radioactivity residues in blood, milk, urine, and feces appeared between the first and second days after treatment. The residues primarily comprised water-soluble fenthion hydrolysis products. The maximum output of fenthion and its organosoluble metabolites in the milk from the two cows occurred on the first day after treatment, anounting to 0.1 μg/ml. Over a four-week period after administration 45-55% of the administered radioactivity was recovered in the urine, 2-2.5% in feces, and 1.5-2% in the milk.

77-0674. Martin, N. A. (Entomol. Div., DSIR, P.B., Auckland, New Zealand). **Effect of four insecticides on the pasture ecosystem. V. Earthworms (Oligochaeta: Lumbricidae) and arthropoda extracted by wet sieving and salt flotation.** *N. Z. J. Agric. Res.* 19(1): 111-115; 1976. (13 references)

The surface of a pasture was treated with four insecticides, fensulfothion, fenitrothion, carbofuran, and DDT at 2.24 kg a.i./ha. An apparatus was developed and used for wet sieving and floating earthworms and arthropods from soil samples, and system was developed for kerosene separation of arthropods. The earthworm population of carbofuran-treated plots was initially reduced to less than 50% of the control level but was restored between 5 and 18 weeks after treatment, apparently by immigration. Large plots are therefore needed to eliminate the distortions caused by worm movement in the study of pesticides toxic to worms. A study of the movement of worms into small plots would reveal the persistence of the biological activity of a pesticide. The other insecticides tested had little or no effect on earthworm populations. The population of aphids in fenitrothion treated plots was less than in control plots at five weeks after treatment but Chironomid populations in fenitrothion and carbofuran treated plots were higher than the control population at 27 weeks.

See also **77-0503** **77-0518**

77-0675. Hallett, D. J.; Norstrom, R. J.; Onuska, F. I.; Comba, M. C.; Sampson, R. (Toxic Chem. Div., Can. Wildl. Serv., Environ. Canada, Ottawa, Ontario K1A OH3, Canada). **Mass spectral confirmation and analysis by the Hall detector of mirex and photomirex in herring gulls from Lake Ontario.** *J. Agric. Food Chem.* 24(6): 1189-1193; 1976. (19 references)

Mirex, 1,2,3,4,5,5,6,7,8,9,10,10-dodecachloropentacyclo $[5.3.0.0^{26}.0^{39}.0^{48}]$ decane (dechlorane), and a monohydro Mirex, 1,2,3,4,5,5,6,7,9,10,10- undecachloropentacyclo $[5.3.0.0^{26}.0^{39}.0^{48}]$ decane (photomirex), were discovered in the whole body lipid of Herring Gulls from Pigeon Islands, Lake Ontario. PCBs, which were evident in high concentrations, coeluted with Mirex and photomirex in residue cleanup procedures, and interfered with their determination by electron-capture gas chromatography (EC-GC) using standard analytical columns. Samples were perchlorinated to remove this interference, and structures were confirmed by gas chromatography/mass spectrometry (GC/MS). The Hall electrolytic conductivity detector was shown to be useful as a specific detector to monitor residues of Mirex and photomirex in the presence of high PCB interference. Eggs of Herring Gulls proved to be useful as indicators of these compounds in Lake Ontario. (Author abstract reprinted by permission of the American Chemical Society)

77-0676. Blair, D.; Roderick, H. R. (Shell. Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **An improved method for the determination of urinary dimethyl phosphate.** *J. Agric. Food Chem.* 24(6): 1221-1223; 1976. (7 references)

A new, rapid, procedure is described for the determination of urinary dimethyl phosphate, a metabolite of some important organophosphate insecticides. Selective removal of inorganic phosphate from the urine with calcium hydroxide eliminates a major source of interference. The urine is reacidified with a cation-exchange resin and treated with diazoethane and the ethyl dimethyl phosphate so formed is determined by gas-liquid chromatography (GLC). The derivatization procedure described ensures complete conversion of the dimethyl phosphate, thus eliminating a potential source of error inherent in earlier methods. (Author abstract reprinted by permission of the American Chemical Society)

77-0677. Downer, G. B.; Hall, M.; Mallen, D. B. (Lilly Res. Ctr. Ltd., ERL Wood Manor, Windlesham, Surrey, England). **Determination of benefin and trifluralin residues by quantitative gas-liquid chromatography/mass spectrometry.** *J. Agric. Food Chem.* 24(6): 1223-1225; 1976. (4 references)

A quantitative GLC-MS procedure is described for the simultaneous determination of benefin and trifluralin residues in soil. Prior gas-liquid chromatographic separation of the two herbicides is not required due to the selective nature of the detector. Comparable soil residue levels are obtained for both the mass fragmentography (multi-ion detector, MID) procedure and an established electron-capture GLC procedure. The MID method has a similar sensitivity to the electron-capture GLC method but has a shorter analysis time. (Author abstract reprinted by permission of the American Chemical Society)

77-0678. Lawrence, J. F. (Food Res. Div., Bur. Chem. Safety, Health Protect. Br., Tunney's Pasture, Ottawa, Ontario K1A OL2, Canada). **Confirmation of some organonitrogen herbicides and fungicides by chemical derivatization and gas chromatography.** *J. Agric. Food Chem.* 24(6): 1236-1238; 1976. (10 references)

The confirmation of residue levels of eight organonitrogen herbicides and two fungicides was carried out by alkylation, methoxylation, and/or trifluoroacetylation. The pesticides included members of the triazine, urea, *N*-phenylcarbamate, thiocarbamate, substituted aniline, and uracil groups. The parents and derivatives were analyzed by gas-liquid chromatography with electrolytic conductivity detection (nitrogen mode). In most cases, conversion of the pesticides to their derivatives occurred in high yields after reaction periods of 1 hr or less at 20-100°C depending upon pesticide and reagent. Identification of the products was aided by mass spectrometry. These confirmation techniques were applied to the analysis of several of the herbicides and fungicides in corn at 0.1 ppm. (Author abstract reprinted by permission of the American Chemical Society)

77-0679. Buser, H. R.; Bosshardt, H. P. (Swiss Fed. Res. Stn., CH-8820 Wadenswil, Switzerland). **Determination of polychlorinated dibenzo-*p*-dioxins and dibenzofurans in commercial pentachlorophenols by combined gas chromatography-mass spectrometry.** *J. Assoc. Off. Anal. Chem.* 59(3): 562-569; 1976. (11 references)

Samples of commercial pentachlorophenol (PCP) and its sodium salt (PCP-Na) were examined for the presence of polychlorinated dibenzo-*p*-dioxins (PCDDs) and dibenzofurans (PCDFs), using a rapid, highly specific method of analysis. Phenolic compounds are removed by alkaline extraction and the neutral minicolumn. After gas chromatographic separation individual PCDDs, and PCDFs are detected by mass fragmentography and their presence is confirmed by complete mass spectral analysis. While some samples had only low amounts of PCDDs and PCDFs, others contained much higher amounts of these components. PCP-Na samples showed the unexpected presence of a tetrachlorodibenzo-*p*-dioxin. Re-analysis of PCP and PCP-Na samples with high PCDD contents on a high-resolution glass capillary column showed the presence of three hexa- and the two hepta-chlorodibenzo-*p*-dioxins with nearly constant isomeric ratios. (Author abstract by permission)

77-0680. Cochrane, W. P.; Greenhalgh, R.; Looney, N. E. (Lab. Serv. Sect., Plant Prod. Div., Agric. Canada, Ottawa, Ontario, Canada K1A OC5). **Gas-liquid chromatographic analysis of ethephon and fenoprop residues in apples and their decline before and after harvest.** *J. Assoc. Off. Anal. Chem.* 59(3): 617-621; 1976. (8 references)

Ethephon (2-chloroethylphosphonic acid) and fenoprop (2-(2,4,5-trichlorophenoxy) propionic acid) may be determined in the same apple sample. After extraction with methanol, two separate methylation procedures were required to quantitatively convert each compound. Ethephon was esterified with diazomethane and analyzed by a flame photometric detector in the P-mode. Fenoprop was esterified with boron trifluoride/methanol and analyzed by electron capture gas chromatography. Average recoveries were about 95% at 0.05 ppm for both compounds. The limit of detection was 0.05 ppm for ethephon and 0.01 ppm for fenoprop in a 1 g sample. The persistence of both compounds before and after harvest was studied. Ethephon and fenoprop were applied simultaneously to apple trees at the recommended concentrations of 300 and 20 ppm, respectively. Ethephon residues averaged 1.6, 0.75, and 0.4 ppm at 2 hr, 10 days, and after washing at 13 days, respectively. The corresponding fenoprop residues were 0.70, 0.025, and 0.024 ppm. (Author abstract by permission)

77-0681. Chau, A. S. Y.; Terry, K. (Water Qual. Br., Special Serv. Sect., Environ. Canada, Burlington, Ontario, Canada L7R 4A6). **Analysis of pesticides by chemical derivatization. III. Gas chromatographic characteristics and conditions for the formation of pentafluorobenzoyl derivatives of ten herbicidal acids.** *J. Assoc. Off. Anal. Chem.* 59(3): 633-636; 1976. (19 references)

The reaction conditions to form pentafluorobenzyl derivatives of 10 herbicidal acids, at pesticide residue levels, were studied. The optimum conditions were reaction at room temperature for at least 5 hr (or overnight), using potassium carbonate solution as catalyst. The gas chromatographic characteristics of these derivatives were also studied. Nine or 10 of these derivatives can be separated on an OV-101/OV-210 gas chromatographic column. (Author abstract by permission)

77-0682. Onuska, F. I.; Comba, M. (Anal. Meth. Res. Sect., Canada Cent. Inland Waters, Burlington, Ontario, Canada L7R 4A6). **Mass spectra of sodium *N*-alkyl and *N,N*-dialkyl dithiocarbamates and some related compounds.** *J. Assoc. Off. Anal. Chem.* 59(3): 622-632; 1976. (7 references)

Electron impact mass spectra were recorded for 8 sodium alkyl and dialkyl dithiocarbamate zinc salts and *N′,N′*-dimethyl- *N,N*-dimethylthiocarbamysulfenamide. The investigated compounds all gave molecular ions, and generalized descriptions of their fragmentation behavior are presented. (Author abstract by permission)

77-0683. Lawrence, J. F.; McLeod, H. A. (Food Res. Div., Health Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada K1A OL2). **Gas-liquid chromatographic analysis and chemical confirmation of azodrin (monocrotophos) residues in strawberries.** *J. Assoc. Off. Anal. Chem.* 59(3): 637-640; 1976. (16 references)

A gas-liquid chromatographic (GLC) method is described for the analysis and confirmation of azodrin (monocrotophos, 3-(dimethoxyphosphinyl) -*N*- methyl-*cis*-crotonamide) residues in strawberries. The strawberries are extracted with acetone, and the filtrate is partitioned with a mixture of methylene chloride and petroleum ether followed by further extraction with methylene chloride. The organic phases are combined, dried with nhydrous sodium sulfate, and concentrated to a small volume for GLC analysis on a 3% OV-210 column with flame photometric detection. Identity of the compound is confirmed by chromatography on the same column after trifluoroacetylation of an aliquot of the strawberry extract. The detection limit is about 2 ppb. The types of strawberry samples analyzed were fresh, frozen, pureed, and jam. (Author abstract by permission)

77-0684. Nanda Kumar, N. V.; Visweswariah, K.; Majumder, S. K. (Cent. Food Technol. Res. Inst., Mysore-570013, India). **Thin layer chromatography of parathion as paraoxon with cholinesterase inhibition detection.** *J. Assoc. Off. Anal. Chem.* 59(3): 641-643; 1976. (18 references)

A simple, sensitive, and rapid method is described for the quantitative estimation of ng amounts of parathion (*O,O*-diethyl *O*-*p*-nitrophenyl phosphorothioate) as paraoxon (*O,O*-diethyl *O*-*p*-nitrophenyl phosphate) on thin layer chromatograms. Paraoxon is detected by cholinesterase inhibition, using *p*-nitrobenzenediazonium fluoroborate as the chromogenic reagent. This chromogenic reagent is more sensitive than Fast Blue B or indoxyl acetate; 0.1 ng may be detected and amounts from 5 to 50 ng may be estimated. The method is a viable alternative to gas chromatographic analysis for parathion. (Author abstract by permission)

77-0685. Byrne, M. J. (Environ. Protect. Ag., Denver Fed. Cent., Denver, CO 80225). **High-speed liquid chromatographic determination of pheonothiazine in commercial pesticide formulations.** *J. Assoc. Off. Anal. Chem.* 59(3): 693-699; 1976. (4 references)

Phenothiazine (thiodiphenylamine) in commercial pesticide formulations is analyzed by high-speed liquid chromatography and ultraviolet absorption detection. Phenothiazine is extracted from the formulation with methanol and injected into the liquid chromatograph. Methanol-water (1 + 1) is the mobile phase. The amount of phenothiazine is calculated from peak height ratios. The liquid chromatographic procedure is much faster than the infrared or colorimetric method and yields values in close agreement with both of these methods. (Author abstract by permission)

77-0686. Cochrane, W. P.; Greenhalgh, R. (Lab. Serv. Sect., Plant Prod. Div., Agric. Canada, Ottawa, Ontario, Canada K1A OC5). **Chemical composition of technical chlordane.** *J. Assoc. Off. Anal. Chem.* 59(3): 696-702; 1976. (14 references)

Technical chlordane, a multicomponent organochlorine insecticide, was separated into 26 peaks by temperature-programmed gas chromatography, using a 3% OV-17 column. Peaks were identified by using combined gas chromatography-mass spectrometry (GLC-MS) and where individual standards were available, by comparing retention times on various columns. Technical chlordane constituents were also investigated by GLC-MS, using a Dexsil 300 column; 19-20 peaks were observed. Quantitation studies indicated differences in the per cent contributions of the constituents, particularly for heptachlor and *trans*-chlordane, in 2 different technical chlordane reference standards. For the same reference standard higher results were obtained by using ^{63}Ni electron capture detection than by using flame ionization detection. By using a combination of 4 GLC columns to overcome peak overlap, it was determined that the 11 known constituents of technical chlordane constituted approximately 40%. (Author abstract by permission)

77-0687. Delfel, N. E. (Northern Reg. Res. Lab., Agric. Res. Serv., U. S. Dep. Agric., Peoria, IL 61604). **Ultraviolet and infrared analysis of rotenone: effect of other rotenoids.** *J. Assoc. Off. Anal. Chem.* 59(3): 703-707; 1976. (20 references)

Biases evidenced by past collaborative trials of ultraviolet (UV) and infrared (IR) methods for rotenone can be caused by interference from other rotenoids that occur in extracts of cube and derris. In the UV analysis, sumatrol, rotenolone, and deguelin cause positive errors of decreasing magnitude; elliptone, toxicarol, tephrosin, dehydrodeguelin, and dehydrorotenone produce negative biases of increasing magnitude. In the IR analysis, error depends on rotenoid concentration relative to rotenone concentration. At equal proportions, bias is positive with toxicarol and deguelin and negative with other rotenoids. The baseline version of the IR method has an inherent positive bias of approximately 8% but is superior to the base point version because of greater insensitivity to deguelin. The official first action UV method for the determination of rotenone in derris and cube powder, 6.162-6.163, has been deleted, and the IR method, 6.164-6.165, has been revised to exclude derris products. (Author abstract by permission)

77-0688. Hanks, A. R.; Cramer, C. R. (Dep. Agric. Anal. Serv., Texas A & M Univ., College Station, TX 77843). **Gas-liquid chromatographic determination of pentachloronitrobenzene in pesticide formulations.** *J. Assoc. Off. Anal. Chem.* 59(3): 708-710; 1976. (6 references)

A gas-liquid chromatographic method has been developed to determine pentachloronitrobenzene (PCNB) in pesticide formulations including dusts, powders, granules, liquids, and fertilizers. Captan, disulfoton, and Terrazole do not interfere. Samples are extracted with chloroform, and an aliquot is mixed with an equal volume of internal standard solution containing *o*-terphenyl. PCNB is chromatographed on a 5% SE-30 column and quantitated by peak height ratios. The method has been subjected to a ruggedness test which indicates little sensitivity to changes in extraction and chromatographic conditions. (Author abstract by permission)

77-0689. Sauer, H. H.; Bosshardt, H. P. (Agrochem. Div., Res., Sandoz Ltd., CH-4002 Basel, Switzerland). **Collaborative study of a method for the analysis of metoxuron and its formulations.** *J. Assoc. Off. Anal. Chem.* 59(3): 711-715; 1976. (4 references)

The method collaboratively studied is based on 3 steps: free interfering amines are removed by acid extraction; dimethylamine is liberated by alkaline hydrolysis; and the liberated amine is distilled into an absorbing solution and continuously titrated. Interfering by products are separately determined by a thin layer chromatographic method. Two samples of metoxuron, the technical active ingredient, and an 80% wettable powder, were analyzed by 18 collaborators from Europe, the United States, and South America; results were satisfactory with an overall coefficient of variation of about 0.8%. Only one outlier was noticed. The method was adopted in 1974 as a full CIPAC method. The method was adopted in 1975 as an official first action AOAC method. (Author abstract by permission)

77-0690. Heizler, W.; Meier, J.; Nowak, K.; Suter, R.; Bosshardt, H. P. (Ciba-Geigy Ltd., CH-4002 Basel, Switzerland). **Collaborative study of a method for the analysis of chlorotoluron and its formulations.** *J. Assoc. Off. Anal. Chem.* 59(3): 716-719; 1976. (4 references)

Chlorotoluron technical and its 80% wettable powder were analyzed by 19 participants in a collaborative study. The analytical method used involves acid extraction to remove interfering free amines, followed by alkaline hydrolysis of the extraction residue, distillation, and titration of the liberated dimethylamine. Related byproducts which may interfere are determined by semiquantative thin layer chromatography. Results obtained from 19 government and industrial collaborators showed good repeatability within laboratories. Good agreement was also achieved between laboratories. An overall coefficient of variation of about 0.8% was obtained. In 1974 the analytical method was accepted as a full CIPAC method. In 1975, the method was adopted as an official first action AOAC method. (Author abstract by permission)

77-0691. Rangaswami, J. R.; Vijayashankar, Y. N.; Mutho, M. (Discipline Infest. Control. Pestic., Cen. Food Technol. Res. Inst., Mysore-570013, India). **Colorimetric method for the determination of ethylene dibromide re-**

sidues in grains and air. *J. Assoc. Off. Anal. Chem.* 59(6): 1262-1265; 1976. (16 references)

A method based on the hydrolytic debromination of ethylene dibromide (EDB) in the presence of an oxidizing agent has been developed. Bromine liberated from inorganic bromide is used to brominate *p*-rosaniline. The intensity of the resulting violet-red bromo compound in chloroform is measured at 580 nm. The relationship between absorbance and concentration of EDB is linear in the range of 5-60 μg. The method is very sensitive and as little as 0.50 ppm unchanged EDB residue in a 20 g sample of fumigated grain and 1 ppm EDB in a 10 ml air sample can be detected. (Author abstract by permission)

77-0692. Nicholas, M. L.; Powell, D. L.; Williams, T. R.; Thompson, R. Q.; Oliver, N. H. (Dep. Chem., Coll. Wooster, Wooster, OH 44691). **Reference Raman spectra of eleven miscellaneous pesticides.** *J. Assoc. Off. Anal. Chem.* 59(6): 1266-1275; 1976. (6 references)

The Raman spectra of IPC (propham), CIPC (chlorpropham), carbaryl, EPTC (ethyl *N,N*-dipropyl (3-chlorophenyl) carbamate), pebulate, CDEC (2-chloroallyl diethyldithiocarbamate), thiram, maneb, zineb, ferbam, and nicotine have been recorded. These spectra are presented, along with tables giving values for the frequencies. (Author abstract by permission)

77-0693. Rangaswamy, J. R.; Vijayashankar, Y. N.; Prakash, S. R. (Cent. Food Technol. Res. Inst., Mysore 570013, India). **A simple spectrophotometric method for the determination of carbofuran residues.** *J. Assoc. Off. Anal. Chem.* 59(6): 1276-1278; 1976. (6 references)

A method has been developed for carbofuran residues, based on coupling carbofuran (2,3-dihydro- 2,2-dimethyl-7- benzofuranyl methyl carbamate) with diazotized aniline to form a yellow compound with an absorption maximum at 460 nm. The relationship between absorbance and concentration is linear for 1-10 μg carbofuran/5 ml. The method is sensitive and can be applied to the determination of levels as low as 0.025 ppm carbofuran in a 40 g crop or soil sample. (Author abstract by permission)

77-0694. Franken, J. J.; Luyten, B. J. M. (Lab. Instrument. Anal., Eindhoven Univ. Technol., Eindhoven, The Netherlands). **Comparison of dieldrin, lindane, and DDT extractions from serum, and gas-liquid chromatography using glass capillary columns.** *J. Assoc. Off. Anal. Chem.* 59(6): 1279-1285; 1976. (17 references)

Rats were given an oral dose of ^{14}C-labeled chlorinated pesticides to obtain serum containing *p,p'*-DDT, dieldrin, or lindane. Simple hexane and formic acid-hexane extraction methods, involving pretreatment of the serum with formic acid, were compared by radiometric and by paper chromatographic and gas chromatographic analysis. *In vivo* binding of chlorinated pesticides to constituents of the serum does not necessarily prohibit their isolation by simple hexane extractions, provided that the extraction is very vigorous and at least 5 min long. Stable emulsions were broken by cooling in liquid nitrogen or Dry Ice-acetone. The hexane extraction method described yields quantitative recovery of the pesticides studied, whereas the formic acid-hexane method is quantitative for *p,p'*-DDT, 93% for dieldrin, and 89% for lindane. Gas chromatographic comparison of both methods, using human serum, shows that the hexane method extracts 16% more β-BHC, 7% more dieldrin and HCB, and 4% more *p,p'*-DDE from serum than does the formic acid-hexane method. The difference for *p,p'*-DDT is not significant. Gas chromatography with glass capillary columns and an all-glass solids injection system yielded detection limits as low as 15 fg. Data show that the use of an internal standard considerably improves the precision of quantitation. (Author abstract by permission)

77-0695. Pribyl, J.; Herzel, F. (Inst. Wasser- Boden-Lufthyg. Bundesgesundheitsamtes, 1 Berlin 33, Germany). **Fluessigchromatographische Parameter herbizider Wirkstoffgruppen. I. Harnstoff-Herbiziden. [Liquid chromatographic parameters of groups of herbicidal active substances. I. Urea herbicides.]** *J. Chromatogr.* 125(3): 487-494; 1976. (5 references) (German)

Because of the polarity of herbicidal urea derivatives, liquid chromatography is the most suitable method for their determination. The separation of a number of active substances is described. A versatile application ternary solvent mixture is used as the mobile phase. Several columns are tested for their separation performances and their capability to retain active substances and some known degradation products. To fully utilize the sensitivity of the photometric detector the UV spectra of the tested compounds are determined. (Author abstract by permission)

77-0696. Bromilow, R. H.; Lord, K. A. (Chem. Liaison Unit, Rothamsted Exper. Stn., Harpenden, Herts., England). **Analysis of sulphur-containing carbamates by formation of derivatives in the gas-liquid chromatograph using trimethylphenylammonium hydroxide.** *J. Chromatogr.* 125(3): 495-502; 1976. (24 references)

Carbamates injected into the gas-liquid chromatograph with trimethylphenyl- ammonium hydroxide react to give derivatives with good gas-liquid chromatographic properties. Oximecarbamates yield methoximes by this procedure, and substituted- phenyl *N*-methylcarbamates yield anisoles. Yields over a range of conditions were generally better than 90%, except from aldoximecarbamates where competing reactions intervened. Although only sulphur-containing carbamates were studied, it should be possible to extend the reaction to other carbamates. (Author abstract by permission)

77-0697. Shanfield, H.; Hsu, F.; Martin, A. J. P. (Univ. Houston, Chem. Dep., Houston, TX 77004). **Use of a gaseous electrical discharge to induce fluorescence in organic compounds separated by thin-layer chromatography.** *J. Chromatogr.* 126: 457-462; 1976. (3 references)

It has been found that a simple gaseous electrical discharge can induce visible fluorescence in a variety of organic compounds separated on silica gel thin-layer chromatoplates. Exposure times ranging from 5 sec to 5 min are ample to detect submicrogram quantities with the unaided eye. The method is simple and convenient, and appears to have broad applicability to a wide variety of organic compounds. It is anticipated that this procedure will lend itself to sensitive quantitation by the use of spectrofluorimetric instrumentation. (Author abstract by permission)

77-0698. Greenhalgh, R.; Wilson, M. A. (Chem. Biol. Res. Inst., Agric. Canada, Ottawa, Ontario K1A OC6, Canada). **Optimization and response of the Pye flame photometric detector to some insecticides in the phosphorus and sulfur modes.** *J. Chromatogr.* 128(1): 157-162; 1976. (8 references)

The Pye flame photometric detector employs concentric glass and metal tubes for the flame jet. This allows a very small hydrogen flow and eliminates the need for a mask. For this relatively new design optimum gas flow must be established in order to obtain the best response. Studies were performed in this connection. Maximum response in the phosphorus mode was obtained at a carrier gas flow of 60 ml/min, a hydrogen flow of 30 ml/min, and an oxygen to hydrogen ratio of 0.10. Linear response was obtained over at least four orders of concentration for diethyl phenyl phosphorothioate, fenitrothion, and diazinon. In the sulfur mode using Ro-Neet (cycloate) the optimum response occurred at an oxygen to hydrogen value of 0.16 and a hydrogen flow of 30 ml/min. The minimum detectable amounts for organophosphorus insecticides range from 0.12 to 0.54 pg P per sec and for sulfur compounds 1.7-5 pg per sec.

77-0699. Maini, P. (Pestic. Res. Lab., Cent. Exp. Res. Siapa SpA, 40015 Galliera, BO, Italy). **Electron-capture gas chromatographic determination of residues of anthraquinone bird repellent.** *J. Chromatogr.* 128(1): 174-177; 1976. (28 references)

9,10-Anthraquinone was expected to display good electron affinity because of the highly conjugated nature of its molecule. A GLC procedure with electron capture detector (RECD) was therefore tried for its determination, and satisfactory results were obtained. Spiked samples of wheat and maize seeds, fresh peas, and agricultural soil were extracted with benzene, then transferred with *n*-hexane onto a silica gel column. The column was eluted with light petroleum-diethyl ether, then analyzed. A Pyrex glass column packed with 3% OV-17 + OV-210 on 100-120 mesh Gas Chrom Q was selected. The nitrogen (carrier gas) flow rate was 60 ml/min and the injection block, detector, and column oven temperature were 210°, 210°, and 185° respectively. The classical pesticide residue analysis column, 200 cm of 10% DC-200 on 80-100 mesh Gas Chrom Q, could also be used with an oven temperature of 195°. Recoveries of anthraquinone were 94-106% in the range 0.5-0.05 ppm.

77-0700. Smith, A. E. (Agric. Can., Res. Stn., Box 440, Regina, Saskatchewan S4P 3A2, Canada). **Use of acetonitrile for the extraction of herbicide residues from soils.** *J. Chromatogr.* 129: 309-314; 1976. (5 references)

Using a 10% aqueous acetonitrile solution for extraction and an identical solvent clean-up procedure, soil-based residues of the herbicides alachlor, benzoylprop-ethyl, flufenprop-isopropyl, flufenprop-methyl, dichlorfop-methyl, nitrofen, and profluralin were recovered reproducibly from three prairie soils fortified at 0.5 and 0.1 ppm levels. The acidic herbicides benazolin, 2,4-D, and 2,4,5-T, together with the acids derived from benzopylprop-ethyl, dichlorfop-methyl, flufenprop-isopropyl, and flufenprop-methyl were reproducibly recovered from the three prairie soils fortified at 0.5 and 0.1 ppm levels using 30% aqueous acetonitrile containing 1% acetic acid after identical clean-up stages. All compounds were analyzed by gas chromatographic means utilising an electron-capture detector. The two procedures described were developed for the routine extraction and analysis of neutral and acidic herbicide residues from field soil persistence studies. (Author abstract by permission)

77-0701. Szalkowski, M. B.; Duane, W. C.; Chin, W. T. (Diamond Shamrock Corp., T.R. Evans Res. Ctr., Painesville, OH 44077). **Separation and detection of thiofanox and its metabolites by thin-layer chromatography.** *J. Chromatogr.* 129: 426-430; 1976. (5 references)

Standard solutions of thiofanox and its sulfoxide and sulfone derivatives as well as further degradation products were separated on prepared silica gel/kieselguhr plates on aluminum with florescent indicators. The plates were developed by ascending chromatography in three different solvent systems. The best overall separation of thiofanox and its metabolites was obtained using hexane-acetone (7:3). The use of hexane-acetone (1:1) resulted in greater separation near the origin and may be useful for purification of the more polar metabolites of thiofanox. Diethyl ether-ethyl acetate (1:1) gave poor separation of thiofanox from one metabolite. The basic permanganate spray reagent was more sensitive than the cloroplatinic acid reagent or iodine vapors. As little as 1 μg each of thiofanox and its major metabolites were detectable.

77-0702. Nasu, H.; Matsuzawa, T.; Kato, S. (Sch. Public Health, Fac. Med., Shinshu Univ., Matsumoto, Nagano, Japan). **[*Lemna perpusilla* as an index of water pollution. Part 1. Responses of L.P. to several heavy metals and some**

herbicides.] *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 31(1): 184; 1976. (Japanese)

Trials were carried out to determine the possibility of using *Lemna perpusilla* strain 6746 along with *L. gibba* G3 and *L. pauticostata* 401 as a method in the bioassay of water pollution. Ten kinds of commercial herbicides including diquat-dibromide, propanil, 2,4-D, *S*-(4-chlorobenzyl)- *N,N*- diethylthiocarbamate, and sodium chlorate were tested against the *Lemna* plants. The responses differed from these due to heavy metals; not only discoloration and stunting were seen but also various types of malformation.

77-0703. Takase, I.; Kamiyama, I.; Kobori, I. (Nihon Tokushu Noyaku Seizo Co. Ltd., Hino, Tokyo, Japan). [**Residue analysis of methylcarbamate and urea pesticides.**] *Proc. Annu. Meet. Food Hyg. Soc. Jpn.* 32: 31; 1976. (Japanese)

Utilizing the fact that the sensitivity of the hydrogen flame ion detector in a gas chromatograph is greatly increased not only for phosphorus but also for nitrogen compounds when an alkali metal salt is inserted in the flame, the residue analysis of nitrogen-containing pesticides was studied. Tablets (12-15 mm in diameter and 1.8-2.0 mm in thickness) with a hole (2.5 mm in diameter) in the center, consisting of sulfate, chloride, and bromide of potassium, rubidium and cesium, respectively were examined for use in the alkali flame ion detector (AFID). *N*-methylcarbamates such as *o*-isopropoxyphenyl methylcarbamate and 2,3-dihydro- 2,2-dimethyl-7-benzofuranyl methylcarbamate were extracted with acetone from the sample, partitioned, purified on a Florisil column, then hydrolyzed at pH 10 and reacted with 2,4-dinitro- 1-fluorobenzene to obtain an amine derivative, and then determined by gas-chromatograph with AFID. The fortified rice straw and soil showed recovery of over 85% and over 90% with a lower limit of 0.005 ppm. Urea pesticides such as diuron were extracted, partitioned, separated by TLC, then methylated and determined. The recovery from fortified brown rice and soil was over 80% with detection limit of 0.01 ppm.

77-0704. Kawamura, Y.; Takeda, A.; Uchiyama, M. (Nat. Inst. Hyg. Sci., Min. Health Welfare, Tokyo, Japan). [**Studies on the analyses of pesticide residues in foods XVII. Simultaneous determination of organophosphorus pesticides.**] *Proc. Annu. Meeting Food Hyg. Soc. Jpn.* 32: 32; 1976. (Japanese)

A method of simultaneous identification and determination of organophosphorus pesticide residues in one crop specimen was studied. After extracting the homogenized specimen with acetonitrile, the extract was partitioned to 20% dichloromethanol-benzene, condensed, water-washed, dehydrated, and purified by column chromatography with activated charcoal plus Avicel (1:10), eluting with benzene. The extract was condensed and gas-chromatographed with temperature rising from 140 to 240°C, on a 4% OV-101 column. From the chromatogram, possible organophosphorus pesticide (OP) residues were presumed. Then the specimen (the final extract) was gas-chromatographed at a constant temperature with a mixed column of 4% OV-101 and 10% QF-1. Crops fortified with several OP compounds such as dichlorvos, salithion, dimethoate, diazinon, dichlorfenthion, fenitrothion, etc. were analyzed by these procedures and fairly good results were obtained qualitatively (in terms of identification) and quantitatively. The principle of the method depends on the retention times of known OPS.

77-0705. Wright, A. N.; Mathews, B. L. (Shell Res. Ltd., Woodstock Lab., Sittingbourne Res. Ctr., Sittingbourne, Kent, England ME9 8AG). **Development of methods for the analysis of crops and soils for residues of benzoylprop-ethyl and its breakdown products.** *Pestic. Sci.* 7(4): 339-348; 1976. (4 references)

Methods are described for the analysis of residues of the herbicide benzoylprop-ethyl, ethyl (±)-2-[*N*-(3,4-dichlorophenyl) benzamido] propionate, and its breakdown product, (±)-2-[*N*-(3,4-dichlorophenyl) benzamido] propionic acid, in wheat and soil. This includes methods for determination of these residues either separately or as a combined residue with unconjugated acid. Efficient extraction procedures have been developed together with partition and column chromatographic techniques for purification of extracts. The full analytical procedures are described and the final determinations are by g.l.c. with electron capture detection with blank values for field samples in the range 0.01-0.05 mg/kg. Good recoveries were obtained. Radiochemical techniques have been used to verify the extraction and subsequent procedures in the methods. (Author abstract by permission)

77-0706. Williams, I. H. (Agric. Can. Res. Stn., Vancouver, BC V6T 1X2, Canada). **Determination of permethrin by gas-liquid chromatography with electron capture detection.** *Pestic. Sci.* 7(4): 336-338; 1976. (2 references)

A method was developed for determining permethrin in potatoes. The insecticide was extracted with acetone and hexane, and partitioned into ethyl acetate. The extract was purified on a column containing a mixture of alumina, "Florisil" and silica gel plus a layer of activated charcoal mixed with cellulose. Analysis was by gas-liquid chromatography with electron-capture detection. Recovery from fortified potatoes ranged from 78 to 91% at 0.01 mg/kg and 98 to 107% at 1.0 mg/kg. The method appears to be applicable to other crops; a trial run on fortified bean leaves gave 80% recovery at 0.1 mg/kg. (Author abstract by permission)

77-0707. Keith, L. H. (U.S. Environ. Protect. Ag., Environ. Res. Lab., Athens, GA 30601). **Recent advances in the identification and analysis of organic pollutants in water.** *Life Sci.* 19(11): 1631-1636; 1976. (24 references)

Forty-seven papers presented at an international symposium on identification and analysis of organic pollutants in water (December 1975, Mexico City) are briefly discussed. Almost 2000 compounds have presently been identified in waters of all types. The development and application of computer-assisted gas chromatography-mass spectrometry has contributed greatly to advances in this area. Sample spectra can be computer-matched with reference spectra in data files containing almost 50,000 mass spectra. Methods have been developed for breaking down the complex sample mixtures prior to MS analysis primarily based on gas chromatography. Another promising separation method is high-pressure liquid chromatography, which may also be coupled with MS. Some specific compound and water source analyses are described.

77-0708. Holder, C. L.; King, J. R.; Bowman, M. C. (Natl. Cent. Toxicol. Res., Jefferson, AR 72079). **4-Aminobiphenyl, 2-naphthylamine, and analogs: analytical properties and trace analysis in five substrates.** *J. Toxicol. Environ. Health* 2(1): 111-129; 1976. (14 references)

Methods are described for monitoring 4-aminobiphenyl, 2-naphthylamine, and their analogs (including biphenyl) as well as the hydrochloride salts of these compounds in a number of media. The media included waste water, microbiological growth media, potable water, human urine, and mouse blood. Spectrophotofluorometry was employed as the determination method. The aminobiphenyls and naphthylamines are extracted as the free amines with benzene, subjected to rapid cleanup on an alumina column, and quantitated in methanol by spectrophotofluorometry. Solutions of the salts in potable water are diluted with 0.01 *N* aqueous HCl and quantitated directly by spectrophotofluorometry. The formulas, maximum fluorescence wavelengths, FID-GLC peaks, and TLC Rf values of biphenyl and other analogs are also provided for comparison.

77-0709. Lawrence, J. F. (Food Res. Div., Dep. Natl. Health Welfare, Tunney's Pasture, Ottawa, Ontario, Canada K1A OL2). **A comparison of electron-capture GLC, electrolytic-conductivity GLC and UV-absorption HPLC for the analysis of some herbicides in foods.** *J. Chromatogr. Sci.* 14(12): 557-559; 1976. (4 references)

Gas chromatography with detection by electron capture or electrolytic conductivity (nitrogen mode) devices was compared with high-pressure liquid chromatography using UV-absorption detection at 254 nm. The basis of comparison was an analysis of linuron, propanil, terbacil, benzoylprop-ethyl, and the fungicide DCNA added to cabbage, corn, potato, and wheat at 2 and 0.2 ppm. The pesticides were extracted with acetone, partitioned into petroleum ether-methylene chloride, and cleaned up on a 2% deactivated Florisil column prior to direct chromatographic analysis. Best results were obtained in the case of DCNA and benzoylprop-ethyl with electron capture GLC, while terbacil was best analyzed by UV absorption HPLC. Results with electron capture GLC and HPLC were similar for linuron and propanil analysis. All pesticides could be detected at the 0.2 ppm level with electrolytic conductivity GLC, and the least number of extraneous peaks were seen in the chromatogram in this case.

77-0710. Sparacino, C. M.; Hines, J. W. (Res. Triangle Inst., Chem. Life Sci. Div., Research Triangle Park, NC 27709). **High-performance liquid chromatography of carbamate pesticides.** *J. Chromatogr. Sci.* 14(12): 549-556; 1976. (19 references)

Studies have been performed on carbamate pesticides using HPLC (high-performance liquid chromatography) with microparticulate packings. Conditions were selected, using both normal and reverse-phase modes, for separating some 30 compounds. The UV characteristics of the carbamates were also determined, with particular emphasis on the low (190-220 nm) wavelength range. Minimum detectable quantities were determined at several different wavelengths in order to supply comparative chromatographic data for practical use. Relative elution orders of the carbamates are presented, and chromatographs are shown for separation of various carbamate mixtures under different chromatographic conditions.

77-0711. Hoffmann, H. P. M.; Petrowitz, H. J. (Bundesanst. Materialpruefung, Berlin-Dahlem, Germany). **Ueber ein neues Verfahren zur Bor-Bestimmung in behandeltem Holz. [A new process for determining boron in treated wood.]** *Mater. Organism.* 11(1): 71-76; 1976. (14 references) (German)

Boron compounds have long been used for fireproofing wood in Germany, but in other countries they have also been used for protecting wood against insects and fungi as well. Therefore simpler analytical methods are needed; the use of Azomethine H in a spectrometric technique provided such a method. The wood is digested either by ashing or by wet digestion; the wet digestion solution can be used directly for spectrophotometric analysis. The sample aliquot is mixed with pH 5.1 buffer solution, EDTA, and a test solution of azomethine H and ascorbic acid. The sample, adjusted to volume, is then permitted to stand for 4 hr and read in a spectrophotometer at 436 nm.

77-0712. Done, J. N. (Dep. Chem., Edinburgh Univ., Scotland). **High speed liquid chromatography of biochemicals.** *Process Biochem.* 11(4): 6-9; 1976. (47 references)

High-speed liquid chromatography has been greatly improved within the past ten years, and the technique is now applicable to a great variety of complex mixtures. It is particularly advantageous for biochemical analyses. Dramatic increases in efficiency have been achieved, permitting the use of much shorter columns. Detection in high-speed liquid chromatography (HSLC) remains a problem. Chemically bonded stationary phases

have been developed which can be used with a much broader variety of mobile phases than was previously possible and can handle a much broader range of sample polarities. Ion pair chromatography is useful for separating compounds that are readily converted to ionic species. Specific applications reviewed include alkaloids, amino acids, lipids and fatty acids, carbohydrates, antibiotics, nucleic acid related compounds, biogenic amines, and miscellaneous products including rotenoids.

77-0713. Lipowska, T.; Kabacki, S. J. (Inst. Indust. Ferment., Dep. Instrument. Anal., Warsaw, Poland). **Adaptacja metody AOAC oznaczania pestycydow chloroorganicznych owocach i warzywach. [Adaptation of the AOAC method for determination of organochlorine pesticides in fruits and vegetables.]** *Pr. Inst. Lab. Badaw. Przem. Spozyw.* 23(2): 321-327; 1973. (4 references) (Polish)

The AOAC method for determination of organochlorine pesticide residues in fruits and vegetables has been adopted with slight modifications for use in Poland. The speciments are first extracted with a mixture of acetone and petroleum ether, then cleaned up on a florisil column, and determined by gas-liquid chromatography with a Ni-63 electron capture detector. Recoveries of *p,p'*-DDT, DMDT (methoxychlor), *p,p'*-DDD (TDE), *p,p'*-DDE, and γ-BHC (lindane) are in the range of 80.3-105.3%.

77-0714. Lipowska, T.; Kubacki, S. J. (Inst. Indust. Ferment., Dep. Instrument. Anal., Warsaw, Poland). **Ustalenie parametrow analizowania zwiazkow fosforoorganicznych na drozde chromatografii gazowek z detektorem termojonowym (TID-CsBr). [Parameters for analysis of organophosphorus compounds by gas chromatography using a thermionic detector (TID-CsBr).]** *Pr. Inst. Lab. Badaw. Prem. Spozyw.* 23(4): 663-671; 1973. (7 references) (Polish)

Operating conditions were selected for analysis of organophosphorus compounds using a gas chromatograph with a cesium bromide thermionic detector. Three columns were tested: 6% OV-101 on Diatomite CQ 80-100 mesh, 10% DC-200 on Diatomite CQ 80-100 mesh, and 8% FS-1 + 2% OV-17 on Diatomite CQ 80-100 mesh. Best results were obtained with the first mentioned column. Acceptable linearity was obtained for trichlorfon at 0.18-43 μg/ml, dimethoate at 0.16-28 μg/ml, fenitrothion at 0.17-28 μg/ml, and malathion at 0.15-48 μg/ml. Additional conditions included a detector temperature of 225°C and argon (carrier gas) flow rate of 40 ml/min. The effect of current background on detector response and background linearity was investigated.

77-0715. Lipowska, T.; Kubacki, S. J.; Goszcz, H. (Inst. Indust. Ferment., Dep. Instrument. Anal., Warsaw, Poland). **Metoda oznaczania pozostalosci pestycydow fosforoorganicznych w surowcach owocowych i warzywnych z zastosowaniem chromatografii gazowej z detektorem termojonowym. [Method for determination of organophosphate pesticide residues in unprocessed fruits and vegetables using gas chromatography with a thermionic detector.]** *Pr. Inst. Lab. Badaw. Przem. Spozyw.* 25(3): 395-407; 1975. (8 references) (Polish)

The Storherr method for determining organophosphorus pesticide residues in unprocessed fruits and vegetables using gas chromatography with a cesium bromide thermionic detector was modified. The pesticides are initially extracted with acetone, reextracted with chloroform, cleaned up on a column packed with activated charcoal, magnesium oxide, and Celite 545, and then analyzed gas chromatographically. Recoveries of 92.8-105% were attained with this method for dimethoate, fenitrothion, malathion, and chlorfenvinphos. The relative error, expressed by the coefficient of variation, ranged between 3.0% and 6.3%. The results obtained were comparable to those obtained with the original Storherr method.

77-0716. Knapek, R.; Chmiel, Z. (Inst. Organ. Ind., 43-200 Pszczyna, Poland). **Photometric determination of dithiocarbamate residues by carbon disulphide evaluation method.** *Nahrung* 20(2): 165-168; 1976. (5 references)

Analytical methods based on carbon disulfide determination for assessment of dithiocarbamate residues in crops are reviewed. The colorimetric step was modified in accordance with the Keppel method. The rection of hydrogen sulfide with *p*-aminodimethylaniline in the presence of ferric ions to form methylene blue was utilized for this purpose. After chloroform extraction the extinction of the colored compound was measured at 650 nm. The sensitivity of this method is excellent, about 2 μg. Recoveries obtained for various crops with zineb and maneb are satisfactory.

77-0717. Konrad, H.; Gabrio, T. (Inst. Milchforsch. GDR, Abt. Chem., Oranienburg, DDR). **Enzymatisch-kolorimetrische Schnellmethode zur Ermittlung von Rueckstaenden phosphororganischer Insektizide in Milch. [Enzymatic-colorimetric rapid method for detecting residues of organophosphorus insecticides in milk.]** *Nahrung* 20(4): 395-398; 1976. (7 references) (German)

A new enzymatic-colorimetric method was developed for the rapid analysis of organophosphate insecticides in milk. The test is based on the color reaction of indoxyl acetate with horse serum esterase (Oroseran Dessau), which is inhibited by organophosphate insecticides. Calibration curves were prepared for trichlorfon and dichlorvos. The limit of detection was 0.22 mg/kg. The actual working time expended per sample was ca. 15 min and the results were available within about 90 min. Cleanup is unnecessary in this method, making it superior to other thin layer and gas chromatographic methods from the methodologic viewpoint. It can be recommended as a screening test for examining milk samples for the presence of organophosphorus insecticides.

77-0718. Romminger, K.; Hoppe, H. (Zentr. Lebensmittelhyg. Untersuchungsst., Berlin, DDR). **Beitrag zur Analytik von Thiabendazol auf Zitrusfruechten und Bananen.** [**Contribution to the determination of thiabendazole on citrus fruits and bananas.**] *Nahrung* 20(4): 407-417; 1976. (10 references) (German)

Two methods are recommended for residue analysis of thiabendazole in and on citrus fruits and bananas. Depending on the anticipated active ingredient content, one or the other of these methods may be used for routine market control. The spectrophotometric measurement of UV absorption is preferred at thiabendazole contents of more than 1 ppm if the prescribed cleanup methods are used. If the detection of thiabendazole and determination of quantities of less than 1 ppm are involved (tolerance levels for core, berry, stone, and peel fruits as well as potatoes are 0.2 ppm). Thin-layer chromatography seems suitable, though it is usually regarded as a semiquantitative method. It seems particularly suitable since a blank value of about 0.2 ppm thiabendazole is falsely detected with the spectrophotometric method due to simultaneous detection of a residual absorption from plant components. This error seems excessive in the case of thiabendazole contents of less than 1 ppm and thus TLC is preferred in such cases.

77-0719. Gabor, T.; Hencsei, P.; Mato-Kovacs, G.; Brandt-Pietrik, E.; Nagy, J. (Lehrst. Anorgan. Chem., Techn. Univ. Budapest, Budapest, Hungary). **Spektrophotometrische Bestimmung der Wirkstoffe in Triazin- und Phenoxyessigsaeurederivaten der Pflanzenschutzmittel.** [**Spectrophotometric determination of the active ingredients in triazine and phenoxyacetic acid pesticide derivatives.**] *Period. Polytech. Chem. Eng.* 17(3): 219-231; 1973. (20 references) (German)

Studies were performed on determining active ingredients in triazine and phenoxyacetic acid derived pesticides. A rapid spectrophotometic analytical method, which could be used even under industrial conditions, was developed. The Na-2,4-dichlorophenoxyacetic acid content of the specimens was determined by measuring the extinction at 283 nm. The concentration and the ratio of the triazine derivatives atrazine, prometryne, and atratone were determined by infrared spectrophotometric measurement in a chloroform solution in the range 1300-1700 cm^{-1}.

77-0720. Tewari, S. N.; Sharma, I. C. (Toxicol. Div., Chem. Examiner's Lab., Agra, India). **TLC technique for the detection and determination of gamma-BHC in biological material.** *Mikrochim. Acta* 2(3-4): 323-326; 1976. (10 references)

The five BHC isomers present in technical benzene hexachloride could be adequately separated by thin-layer chromatography on silica gel G impregnated with silver nitrate solution. The γ-BHC isomer (lindane) was identified by running the sample with a reference standard of lindane. Levels of lindane amounting to 5-20 mg could be suitably estimated by measuring the spot area; the method was successfully tried on autopsy tissues. The limit of identification was 0.1 μg. The developing solvent was petroleum ether-liquid paraffin (90:10), and spot color could be developed by irradiating for 10 min with long-wave ultraviolet light (360 nm) or keeping the plate in bright sunlight for 15 min.

77-0721. Zietek, M. (Inst. Toxicol. Forensic Chem., Med. Acad., Cracow, Poland). **Ueber die polarographische Bestimmung von Parathion und aehnlichen Insekticiden neben ihren Metaboliten im Blut ohne Extraktionsverfahren.** [**Polarographic determination of parathion and similar insecticides as well as their metabolites in blood without extraction.**] *Mikrochim. Acta* 2: 549-557; 1976. (20 references) (German)

In order to determine various organophosphate compounds simultaneously with the nitrophenols formed from by enzymatic hydrolysis in blood without prior extraction it was necessary to find a basic solution which permitted not only polarographic reduction of these compounds in blood but also a correspondingly great difference in the half-wave potential. Well developed curves were obtained with a base electrolyte of Britton-Robinson buffer (pH 7.25), methanol, and acetone in a 1:5:4 ratio at the rate of 1 ml blood/10 ml final dilution. Following administration of the test compounds at LD50 doses nonhydrolyzed phosphate esters were found in the blood, e.g., parathion, methyl parathion, EPN, chlorthion, and folithion, along with metabolites identified polarographically and chromatographically as *p*-nitrophenol, chloronitrophenol, and methylnitrophenol. Only unchanged isochlorthion was seen after administration of this compound. Detection of the metabolites in the blood confirms the hypothesis that arylesterases capable of hydrolyzing pesticides are present in many organs and tissues and especially in blood serum.

77-0722. Kneffel, S.; Desi, I.; Sarosi, E. (Nat. Inst. Hyg., Budapest, Hungary). **Nachweis der geringfuegigen pesticiden Wasserverschmutzung mit Hilfe einer auf der Veraenderung der physiologischen Funktion beruhenden Methode.** [**Detection of low pesticidal water pollution by a method based on the changes of the physiological function.**] *Gesundheits-Ingenieur* 97(5): 106-113; 1976. (4 references) (German)

A simple, inexpensive biological test method was developed for detecting very low levels of water contamination. The method determines pollutant burdens which are just barely able to cause a reversible alteration in the vital function of a sensitive aquatic organism. For the assay the larvae (glochidia) of the mussel *Anodonta cygnea* are washed out from the gill folds of adult organisms and stored in a cool place. For use in the test a pipette full of larvae is placed on a hanging-drop slide on an ice-cooled microscope stage. After a waiting time of 1 min

during which the larvae adapted to altered light conditions, the number of closings of the 30-32 larvae visible in a single field at 12-fold magnification within three minutes is counted. If this is satisfactory the test substance is added to the system containing the larvae and the counting repeated once a day for 5 days. No-effect thresholds (detection limits) found in this manner were 0.1 μg/l for Baygon 20 EC (propoxur) and Nexion 40 EC (bromophos) and 10 ng/l for cythion (malathion). Statistical analysis of the results is required. The test is significantly more sensitive than either the *Lebistes reticulatus* or the *Daphnia magna* bioassay.

77-0723. Roder, C.-H.; Laass, H. (Zentr. Anal. Schering AG, Werk Wolfenbuettel, Germany). **Beitrag zur Analytik der Phenoxyalkansaeuren. Analysenmethode zur Bestimmung von 2,4-D-, MCPA- sowie Mecopropsalzen in fluessigen und festen Formulierungen. [Analysis of phenoxyalkanoic acids. Analytical methods for the determination of 2,4-D, MCPA- as well as Mecoprop salts in liquid and solid form.]** *Nachrichtenbl. Dtsch. Pflanzenschutzd. (Braunschweig)* 28(11): 170-173; 1976. (5 references) (German)

The German Working Group for Pesticide Analysis developed a method for determination of MCPA, mecoprop (MCPP), and 2,4-D. The method was tested in collaborative trials by 10 laboratories and was officially adopted. For this analysis the total phenoxyalkanoic acids are precipitated from liquid formulations or from solid salt formulations using sulfuric acid, then extracted, and the total acid titrated potentiometrically. The pure acid content is determined gas chromatographically by converting the total acids to the corresponding methyl esters with diazomethane. The percentages of the individual acids are calculated after separation from impurities according to the peak area fractions in relation to total acid.

77-0724. Fagerstrom, T.; Asell, B. (Swed. Water Air Pollut. Res. Lab, S-100 31, Stockholm, Sweden). **Caged fish for estimating concentrations of trace substances in natural waters.** *Health Physics* 31(5): 431-439; 1976. (19 references)

The theoretical background of the concept of using caged fish to estimate concentrations of bioaccumulable trace substances in natural waters was examined. The primary reason for using this technique is that for most trace substances only a certain fraction of the total concentration will be biologically available; this fraction is usually unknown. Therefore conventional analytical methods may produce biologically irrelevant values. In general there are three requirements for this method: that the metabolic rate of the experimental fish be constant, that the numerical turnover factor of the trace substance in the fish has been determined, and that the oxygen withdrawal efficiency be constant and numerically determined. The mass concentration relative to oxygen of accumulable trace substances in the ambient water can then be determined. The method was applied to evaluating biologically available levels of methyl mercury in a lake.

77-0725. Luther, D.; Schindler, G.; Roessler, M. (Zentralinst. Isotopen- Strahlenforsch., Akad. Wiss., Leipzig, DDR). **Einsatz von Radiotracermethoden bei der quantitativen Bestimmung des Pflanzenschutmittels Dimethoate. [Use of radiotracer methods in the quantitative determination of dimethoate.]** *Isotopenpraxis* 10(8): 298-302; 1974. (26 references) (German)

Radiotracer methods are useful for two purposes: direct determination of specific compounds and monitoring the results of other methods. ^{32}P-dimethoate was employed to assess the effectiveness of dimethoate extraction with water–*n*-heptane and the subsequent workup. The effects of industrial byproducts on the extraction process were also examined. The radiotracer experiments demonstrated that repeated extraction of the aqueous dimethoate containing phase with chloroform substantially improved the effectiveness of the analytical process prior to bromometric titration. The influence of industrial contaminants on the titration analysis was slight. To perform the isotope dilution analysis, after checking the sample for impurities, it is dissolved with a known quantity of radiolabeled dimethoate (heated as necessary), then cooled to precipitate the crystalline compound. The specific activity of the recrystallized specimen is determined.

77-0726. Garcia-Gutierrez, A. G. (Union Explosivos Rio Tinto S.A., Madrid, Spain). **Estudios sobre azo-absorciometrias. IX. Applicaciones en analisis de pesticidas. [Azo-absorptiometric studies. IX. Applications in pesticide analysis.]** *Ion* 35(412): 785-789, 809; 1975. (6 references) (Spanish)

Diazotization-coupling is a technique of wide applicability in pesticide analysis. Certain pesticides themselves may act directly as diazotizing or coupling reagents. Nitro compounds are reduced to primary aromatic amines by nascent hydrogen. Phenylcarbamates, phenylureas, and some organophosphorus esters are converted by alkaline hydrolysis to products that can be assessed by azo-absorptiometry. Analytical procedures are presented for amitrole, dinitrophenol, carbaryl, and azinphosmethyl.

77-0727. Ciupe, R. (Inst. Ig. Sanat. Publ., Cluj-Napoca, Romania). **Determinarea HCH, *p,p'*-DDT, and *p,p'*-DDE in food and adipose tissue. [Determination of BHC, *p,p'*-DDT, and *p,p'*-DDE in food and adipose tissue.]** *Igiena* 25(2): 113-117; 1976. (12 references) (Romanian)

Organochlorine determinations were performed on 1500 specimens of selected food and the results compared with levels found in human adipose tissue. The adipose tissue determinations were performed by gas chromatography on tissues collected during surgery and preserved in

2% formaldehyde. The samples were homogenized with petroleum ether, the solvent evaporated, and the residue taken up in petroleum ether, then injected onto a gas chromatograph with a Ni-63 electron capture detector. The column was packed with 5% QF-1 on chromosorb W (AW, DMCS, 80-100 mesh). The column temperature was 193°C. The carrier gas was nitrogen at 3 atm. The limits of detection were between 0.025 mg/kg (BHC) and 0.075 mg/kg (DDT). Recoveries were 93-94%. Mean dietary levels in 1973-1974 were DDT 0.396 ppm, DDE 0.185 ppm, and total BHC 1.334 ppm. Mean DDT contents in human adipose tissue in 1972-1973 were 0.68 ppm, DDE 1.55 ppm, and total BHC 2.56 ppm.

See also **77-0523**

77-0728. Tokes, B. (Inst. Med. Phys., Tirgu Mures, Romania). **Studiul polarografic al unor erbicide din clasa derivatilor clorurari ai acidului fenoxiacetic. [Polarographic analysis of some chlorophenoxyacetic acid herbicides.]** *Igiena* 25(2): 129-132; 1976. (14 references) (Romanian)

An indirect polarographic method was developed for qualitative and quantitative determination of chlorophenoxyacetic acid herbicides. Sample extracts were treated with a nitrating mixture, then neutralized, and the neutralized solution taken for polarographic analysis in an indifferent electrolyte. The accuracy of determination was 3%; the method is sensitive, selective, and simple.

PESTICIDES ABSTRACTS

QUARTERLY INDEX

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PREFACE

The basic design for this index was supplied by the Technical Services Division, Office of Pesticide Programs, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other compound designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc.).

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